Perceived E-Procurement Quality: Exploring and measuring the construct at a tactical level within the public sector

By

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Abbreviations

ANOVA	Analysis of Variance
B2B	Business to Business
B2C	Business to Consumer
BACS	Bankers Automated Clearing System
BV8	Best Value Performance Indicator
CC	County Council
CFA	Confirmatory Factor Analysis
EDI	Electronic Date Interchange
EFA	Exploratory Factor Analysis
EGS	E-Government Solutions Ltd
EMI	Essex Marketplace Implementation
EP	E-Procurement
EPQ	E-Procurement Quality
ERP	Enterprise Resource Planning
E-SQ	E-Service Quality
EUCS	End-User Computing Satisfaction
FMS	Financial Management System
IDeA	Improvement & Development Agency
ISS	Information Systems Success Model
ISQ	Internal Service Quality
IT	Information Technology
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
LAN	Local Area Network
LAUG	Local Authority User Group
MAR	Missing at Random
MCAR	Missing Completely at Random
MRO	Maintenance, Repair & Operation
MSE	Mean Squared Error
MSR	Regression Mean Square
MVA	Missing Value Analysis
NASA	National Aeronautics & Space Administration
NHS	National Health Service
NOAC	Next Operation as Customer
NPO	Non-Profit Organisation
NPR	Non-Product Related Expenditure
OEPQ	Overall E-Procurement Quality
OGC	Office of Government Commerce
PAF	Principal Axis Factor Analysis
PCA	Principal Components Factor Analysis
PO	Purchase Order
SQ	Service Quality
STV	Subject to Variable
TQM	Total Quality Management
UIS	User Information Satisfaction
USISF	User Satisfaction with Information Systems Function
WEB	Warwick E-Business
XML	Extensible Mark Up Language

Acknowledgements

This study has taken a good deal of determination and I'm hugely grateful for the encouragement given to me by numerous people. My wife, Emma, has given me the most wonderful support. She has never once stopped believing in me, even when I have had doubts. Her love has given me the strength to work through problems and to stay positive. Most importantly, she has helped me keep some perspective about what truly matters in life.

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Without access to organisations, there is no way I could have undertaken this study. I appreciate the help given to me by Gary Richardson, Russell Charlesworth, and Adrian Gibson in identifying potential cases. Additionally, my thanks go to Stephanie Bickerdike, Jon Cooke, Jane Tyler, and John Wickes, who were willing to talk at length about their implementation experiences and point me in the direction of users in their organisations. I am grateful to all those who have taken part in the study, at whatever stage of the process they've been involved. Finally, I wish to thank my two examiners, Andrew Cox and Luitzen de Boer for taking the time to read this thesis.

Declaration

I declare that the work reported in this dissertation is my own[1]. No part of this dissertation has been submitted to any journal for publication or to any university for any degree, diploma or other qualification.

Alistair Brandon-Jones
June 2006

[1] Data for the replication study, reported in chapter seven, was collected by Erik van Raaij, whilst the analysis was carried out by the author.

Abstract

E-procurement has been heralded as a critical enabler in reducing procurement expenditure. However, many businesses report disappointing results from e-procurement implementation, partly because end-users fail to comply with systems or contracts. End-user perceptions of e-procurement quality are considered an important driver of both system and contract compliance. However, very little is written about what e-procurement quality is and how it might be measured.

This thesis presents the findings of a study exploring e-procurement quality from an end-user perspective (*Perceived EPQ*). The researcher seeks to develop a scale to measure the construct. In doing so, it is necessary to identify the components and structure of *Perceived EPQ,* and to examine how measurement may be operationalised. The study presents analysis to answer three research questions:

RQ1: What are the components of Perceived EPQ?
RQ2: What is the structure of Perceived EPQ?
RQ3: How can Perceived EPQ measurement be operationalised?

Different areas of literature are examined to determine how *Perceived EPQ* may be theoretically and operationally defined. Disconfirmation theory, found in much of the *Service Quality* literature, conceptually underpins *Perceived EPQ*. At an operational level, the construct is partly informed by *E-Procurement, Internal Service Quality, Information Systems Quality* and *E-Service Quality* literature, but most importantly by empirical study.

A case study approach, using mixed methods, is applied to identify the components and structure of *Perceived EPQ.* The main study has been carried out in four U.K. public sector organisations. The public sector has been selected, partly because government targets for e-procurement in 2005 mean that the issue is high on the agenda of local authorities nationwide. This has been a significant enabler in gaining access to suitable organisations. In addition, a replication study has been carried out in a Dutch university. Selecting a non-U.K. case allows an assessment of how well

research findings hold up in a distinctly different research context. Empirical analysis suggests a construct made up of 30 components, which are incorporated in a proposed *EPQ Scale.* These variables group into six dimensions – *Training, Professionalism, Processing, Content, Usability,* and *Specification.* The research also examines contingencies for managers to consider when selecting the most appropriate method for measuring *Perceived EPQ.*

This study is the first to empirically examine *Perceived E-Procurement Quality* and to develop a tool for its measurement. The conceptual model proposed illustrates the importance of *Perceived EPQ* in driving e-procurement compliance and ultimately procurement expenditure. The measurement tool – the *EPQ Scale* – is a useful diagnostic instrument which can highlight areas of weakness in e-procurement delivery. Finally, the contingency approach allows managers to select the most appropriate method of construct measurement based on their own objectives.

The research has generated new research questions and the adoption of findings by a number of practitioners and academics suggests this is an area with great potential for future study. Further work is already underway testing research findings from this study and exploring new areas related to *Perceived EPQ*.

Chapter 1: Introduction

The research presented in this thesis is about exploring e-procurement quality from an end-user perspective (*Perceived EPQ*). This chapter provides a brief background into the study and then reviews the research objectives and questions. An overview of relevant literature is then given, followed by details of the thesis structure.

1.1 Background

In 2001, the author carried out an *OGC*-commissioned project to examine key barriers and enablers to e-procurement implementation (Croom & Brandon-Jones, 2005, 2006). The case-based research focused on organisations that reported either very high or very low levels of success with e-procurement. Evidence from interviews with purchasing managers in a range of industries all pointed to a key concern – the lack of e-procurement compliance, defined as the level of system and contract use. Individuals who were unhappy with e-procurement delivery invariably found alternative ways of buying goods and services. Even when system use was high, the level of contract compliance often failed to meet management expectations. It was clear that those implementing e-procurement were often out of touch with those expected to use the systems. The ability to understand the requirements of potential e-procurement users appears critical in the eventual success or failure of implementation. Within the literature, there is very little discussion of e-procurement quality, as perceived by end users. The lack of antecedent literature was therefore a key motivator in undertaking an in-depth study of *Perceived EPQ*.

1.2 Research Objectives & Questions

It has been argued by a number of academics and practitioners that the benefits of e-procurement implementation can only be fully realised if individuals use the system and its contracts appropriately – that is, if they are compliant. In turn, *Perceived EPQ* has been noted as an important driver of both system use (system compliance) and contract use (contract compliance). However, to date there has been no rigorous empirical examination of *Perceived EPQ*.

The overall aim of this study is to model *Perceived EPQ*, based on an in-depth investigation of e-procurement users, and develop a tool for its measurement. In doing so, it is necessary to identify the components and structure of *Perceived EPQ*, and to examine ways to operationalise construct measurement. Research objectives give rise to the following three questions:

RQ1: What are the components of Perceived EPQ?

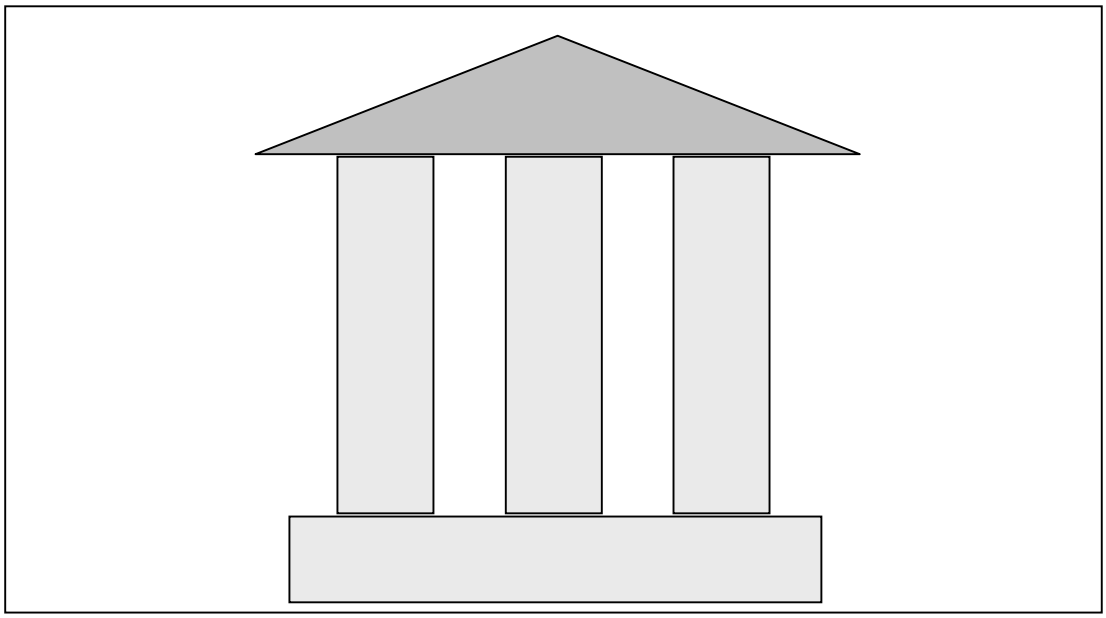
RQ2: What is the structure of Perceived EPQ?

RQ3: How can Perceived EPQ measurement be operationalised?

1.3 Relevant Literature

Figure 1 illustrates how, in seeking to conceptualise and measure *Perceived EPQ*, the research draws on various areas of literature. At a theoretical level, disconfirmation theory, used in much of the *Service Quality* literature, provides the conceptual underpinning of the construct. However, much work in this area is based on very different contexts to e-procurement. Therefore, at a more operational level, the construct is informed by three 'pillars' of literature – *Internal Service Quality, Information Systems Quality* and *E-Service Quality* – in addition to *E-Procurement* literature and empirical investigation.

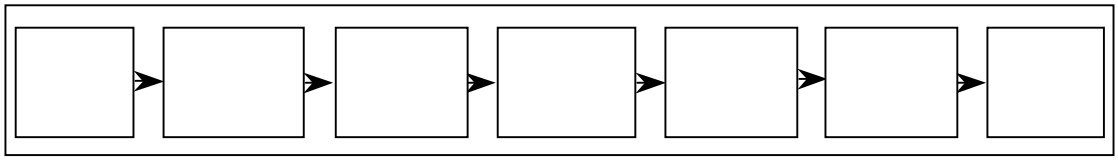
Figure 1. Foundation & Pillars of *Perceived EPQ*



1.4 Research Process & Thesis Structure

Gill and Johnson (1991) propose a generic framework for conducting research **(Figure 2)**, but note that their linear development sequence is rarely applied in its purest sense. Whilst the process is more strictly used in positivist research, the framework provides a good overview of the key stages in this study.

Figure 2.Generic Research Process



Gill & Johnston, 1991

Chapter 2 begins by reviewing the e-procurement literature that relates to the study. Having explored the financial impact of system implementation and the importance of user compliance in delivering savings, the role of *Perceived EPQ* is addressed. The second section establishes the theoretical foundations of the construct within the *Service Quality* literature. It particularly focuses on the efficacy of the widely-used *SERVQUAL* scale (Parasuraman *et al.* 1988) at a theoretical and operational level.

Chapter 3 explores the three pillars of literature on which the *Perceived EPQ* construct is based. Most *Service Quality* literature considers service as it relates to external customers in an off-line setting. However, *Perceived EPQ* is grounded in a mixed (on-line/off-line) internal customer context. *Internal Service Quality, Information Systems Quality,* and *E-Service Quality* occupy different areas within the literature framework. As such, these areas are particularly relevant in delineating *Perceived EPQ*, because of their internal focus (*Internal Service Quality*), on-line focus (*E-Service Quality*), or both (*Information Systems Quality*). The chapter finishes by detailing the three research questions.

Chapter 4 reviews the meta-theoretical and methodological assumptions of the study. The first section examines the philosophical options related to ontology, epistemology, human nature, and methodology. The second section examines research design and methods options, considering the level of interference, time horizon, research setting, research approaches, and method options. The third section presents

the decisions made concerning philosophy, research design, and methods for this study. This is followed by more specific detail of the approach selected for the research, considering case selection in the U.K. and Holland, design, collection, preparation, and analysis. Finally, tactics for ensuring quality of research are reviewed.

Chapter 5 presents empirical analysis from *Phase 1* and *2* of the study, with the objectives of delineating *Perceived EPQ* and developing a measurement scale for the construct. The first section presents data from the coding process, with the aim of defining and refining components of *Perceived EPQ.* The final set of selective codes is presented in the second and third sections. The last section presents analysis which validates these components. Based on this analysis, a measure of *Perceived EPQ* – the *EPQ Scale* – is proposed.

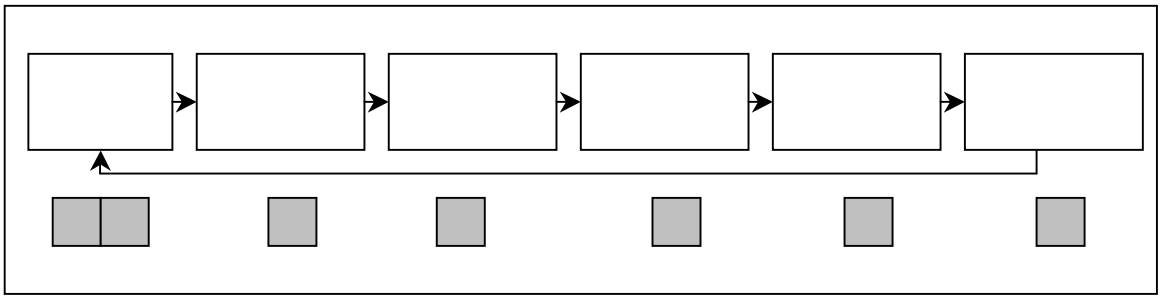
Chapter 6 presents empirical analysis from *Phase 3* of the study, with the aim of examining the structure of *Perceived EPQ*, validating the proposed *EPQ Scale*, and assessing alternative ways to operationalise construct measurement. The structure of *Perceived EPQ* is examined through factor analysis, with the solution then assessed for reliability, content validity, construct validity, and predictive validity. The chapter ends by examining the relative merits of paired-statement and single-statement approaches to operationalising *Perceived EPQ* measurement.

Chapter 7 presents analysis from a *replication study*, with the aim of testing findings from the main study. The replication in a Dutch university is focused on assessing the applicability of the *EPQ Scale* to a different e-procurement context and suggesting any areas for improvement. The chapter presents pre-test analysis prior to factor analysis of data. Validation efforts consider the reliability and validity of three different *EPQ Scale* options – the original U.K. scale, the Dutch scale, and a 'robust' scale comprising only the items that load on the same factors across both studies.

Chapter 8 draws conclusions on the *Perceived EPQ* study. It begins by addressing each research question. The quality of findings and research limitations are then examined. This is followed by assessing the contribution of the research to both

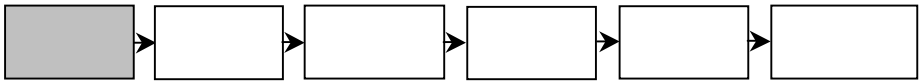
academics and practitioners. Opportunities for further research are then presented and final thoughts are reported to conclude the thesis. **Figure 3** shows the structure of the thesis.

Figure 3. Thesis Structure



At the start of each chapter, this figure is shown, to illustrate the position of the reader within the research process. In addition, mini-diagrams are used within chapters, as a visual pointer to what is covered in different sections.

Chapter 2: The Foundations of Perceived EPQ



This chapter begins by reviewing the e-procurement literature that relates to the study. Having explored the financial impact of system implementation and the importance of user compliance in delivering savings, the role of *Perceived EPQ* is addressed. The second section seeks to establish the theoretical foundations of *Perceived EPQ* within the *Service Quality* literature. In particular it examines the use of *disconfirmation theory* in modelling service quality. Subsequently, the work of Parasuraman, Zeithaml and Berry (1985-1994) is reviewed, including the ongoing debate over the validity of their *SERVQUAL* methodology and its application to various research contexts.

2.1 E-Procurement & Perceived EPQ

This section explores the e-procurement literature related to the study. Having defined terms, it examines a key agenda for many e-procurement academics – the financial impact of implementation. The affect of compliance in delivering transaction and price savings is then reviewed. The section concludes by exploring the role of *Perceived EPQ* in driving compliance and ultimately delivering potential financial benefits of e-procurement.

2.1.1 Defining E-Procurement

Harink (2003) refers to e-procurement as the use of various forms of communication technology (usually web-based) at some or all stages of the procurement process. This may include initial need identification and specification, through the search, sourcing and negotiation stage of contracts and order placement, and on to include mechanisms that register receipt, trigger payment and support post-supply evaluation. Of the limited number of authors who distinguish between types of e-procurement, de Boer *et al.* (2002) and Harink (2003) are perhaps the most useful. de Boer *et al.* (2002)

suggest that e-procurement can be broken down into *e-sourcing, e-tendering, e-reverse auctioning, e-MRO, Web-based ERP* and *e-informing.*

E-Sourcing tools are designed to facilitate the process of identifying new suppliers. *E-Tendering* is concerned with sending requests for quotes to potential suppliers and dealing with responses. *E-Reverse Auctioning* enables buyers to purchase from a number of suppliers using a reverse auction mechanism. *E-MRO* and W*eb-based ERP* tools are concerned with the process of creating and approving purchase requisitions using Internet technology. Finally, *E-Informing* systems are aimed at gathering and distributing information, such as spend analysis and system compliance data, from internal and external parties (de Boer *et al.* 2002). Harink (2003) posits a similar set of e-procurement types, combining *e-MRO* and *Web-based ERP* into *'E-Ordering',* and re-naming *e-Informing 'Purchasing Intelligence'*.

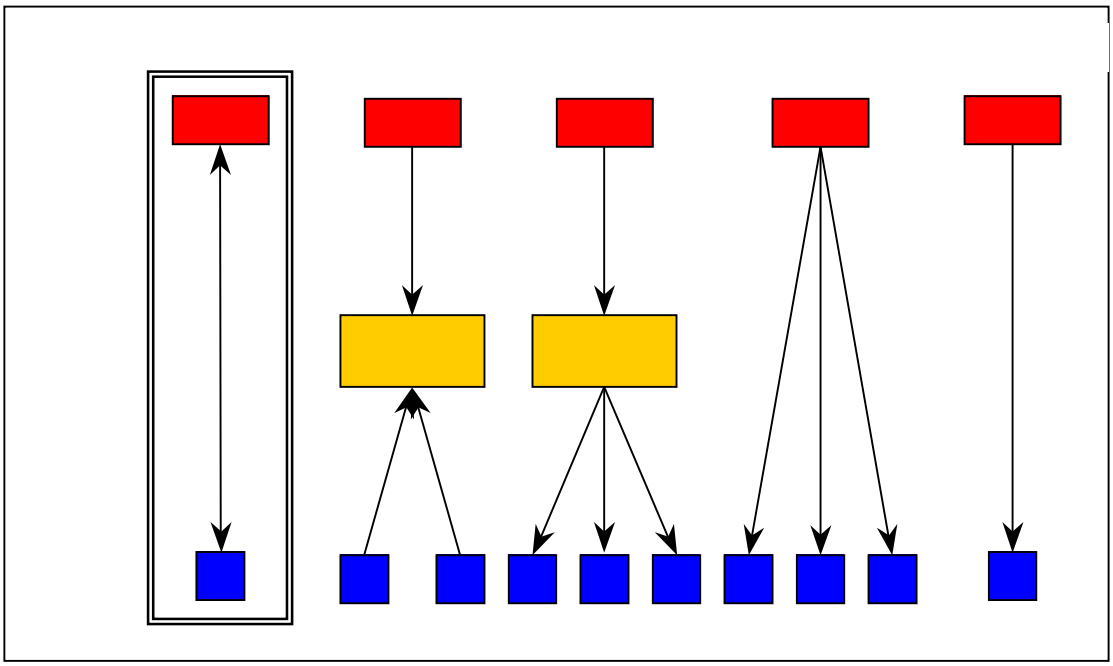
The majority of authors seem to treat e-procurement as a single entity despite the fact that in many cases only certain types are actually being examined. Therefore, it is important to clarify the use of the term in this study. *E-sourcing, e-tendering,* and *e-reverse auctioning* systems all focus on purchasing at a strategic level. As such, these activities tend to be carried out by the purchasing department or by senior personnel across an organisation. This study is more concerned with e-procurement at a tactical level – activities that include a much broader set of users, sometimes referred to as internal customers (See Section 3.1 for more discussion on this issue). The term *'e-procurement'* applied in this research is focused on requisitioning, delivery, invoicing, payment, and basic reporting. As such, it relates to the terms *E-MRO, Web-based ERP,* and *E-Informing* used by de Boer *et al.* (2002).

Types of e-procurement systems

E-procurement systems mirror traditional procurement systems through the provision of two distinct but connected infrastructures - internal processing and external communications (Croom, 2000, 2001). These systems allow individual employees to search for goods, services or suppliers, place orders and initiate payment on delivery (Croom & Johnston, 2003). Vadya *et al.* (2004) argue that there are three types of system – *buyer systems, seller systems,* and *online intermediaries*. Croom and

Brandon-Jones (2005) suggest five contrasting exchange stereotypes employed within e-procurement transactions **(Figure 4).**

Figure 4. Classifying E-Procurement Transactional Structures



Croom & Brandon-Jones (2005)

An *Extranet* is a network of Intranets that connect organisations and limit access to individuals within those organisations. They are used primarily for shared and collaborative data – such as delivery scheduling and product design data. Pre-Internet, *EDI* links represented a type of extranet connection, being dedicated to an individual customer.

Exchange refers to trading sites such as the *e-Bay B2C* e-commerce auction site and the *B2B* auction service provider Free Markets and Synerdeal. These sites allow buyers or sellers to bid for contracts, which in the case of *e-Bay*, simply involves bidding for products offered for sale by private as well as commercial various, whilst *B2B* exchanges provide reverse auction facilities.

A *Marketplace* is in essence a multi-supplier/multi-products catalogue often hosted and maintained by a third party and access provided to users via Internet or *LAN* connection. E-Marketplaces often include directories of buyers, e-catalogues, limited access, and charging of suppliers. As such, they are more like trading communities rather than 'perfect marketplaces.' (Segev *et al.* 1999)

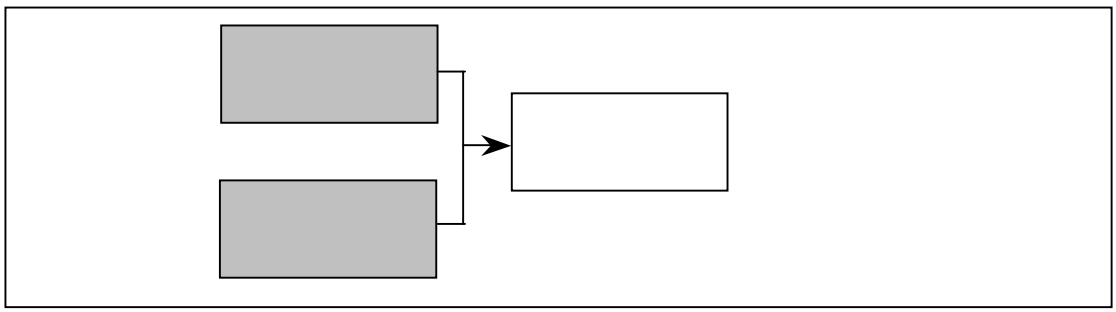
Often also called a *'buy-side'* solution, a *Company Hub* is similar to a marketplace. However, the buyer hosts and maintains a multi-supplier/multi-product catalogue, rather than a third party organisation

Public Web allows Internet buyers to identify potential suppliers via standard search engines or specialist trading search engines. On-line search and comparison of list prices are typically used for one-off, specialist or low value purchases. Depending on the nature of the supplier's website facility, orders may be placed on-line, via email or through the more traditional route of telephone, fax or mail.

2.1.2 The Financial Impact of E-Procurement

Given the high percentage of turnover accounted for by purchasing[2], one of the key themes in the existing literature is concerned with the financial impact of implementing e-procurement (McManus, 2002). Procurement expenditure may be influenced by reductions in transaction costs and purchase price **(Figure 5)**. Efficiencies arise through the reduced activity needed to complete the requisition-to-payment process, the increased speed of procurement, and the opportunity to lower prices from suppliers (cf. Min & Galle, 1999; Croom, 2000; Emiliani, 2000; Essig & Arnold, 2001; Neef, 2001; Zsidisin & Ellram, 2001; Cox *et al.* 2002; de Boer *et al*, 2002; Wyld, 2002). However, the precise financial impact of such efficiencies remains unclear (Lancioni *et al.* 2000; Knudsen, 2003). The impact of e-procurement on transaction costs and purchase price is now discussed.

Figure 5. Financial Impact of E-Procurement



[2] de Boer and Telgen (1998) estimate that purchasing accounts for 60 to 90 percent of total turnover.

2.1.3 Impact on Transaction Costs

Transaction costs reflect the work involved in processing an order (Croom & Johnston, 2003). They include the cost of supplier search and selection, processing the order requisition, authorisation, order generation, receipting, invoicing and payment. Nolan (1999) suggests that the cost of raising an order and paying an invoice prior to e-procurement implementation usually exceeds £100. Research by Croom and Johnston (2003) puts the figure between £97.60 and £147.50. The potential for internal process savings is partly determined by the situation *prior* to e-procurement (de Boer *et al.* 2002). Only where the existing procurement processes are inefficient or where there are many purchase orders are significant cost savings likely. A number of studies propose percentage reductions in transaction costs resulting from e-procurement implementation. These include 60% (Croom & Johnston, 2003), 66% (Croom, 2000), and 90% in British Telecom (Woodall, 2000). Others suggest reductions per order, including £100 to £2 (Nolan, 1999) $150 to $10-$20 (National Association of Purchasing Management), $75 to $3 (Smeltzer & Ruzicka, 2000), $40-$200 to $1-$20 (Eisenmann, 2002).

Sources of Transaction Savings

Prior to order placement, the use of e-sourcing reduces the time taken to find suppliers of goods or services, increasing the economies of supplier search (Evans & Wurster, 2001; Cox *et al.* 2002a, 2002b; de Boer *et al.* 2002; Narasimhan *et al.* 2003; Presutti, 2003; Harink, 2003; Subramaniam & Shaw, 2004; Croom & Brandon-Jones, 2005). In addition, e-tendering helps to simplify the tender process (de Boer *et al.* 2002). E-reverse auctions can significantly reduce processing costs through the reduction in cycle time (Emiliani, 2000; Smeltzer & Carr, 2003; Cox & Watson, 2004; Wagner & Schwab, 2004) and negotiation (Jap, 2002). Post purchase, there is an increase in the speed and accuracy of data collection (Croom, 2000).

However, the vast majority of transaction savings accrue from improvements to the purchase process itself. These savings are realised through reduced work in process (Cox, 1999; Zsidisin & Ellram, 2001); increased automation of processes (Kalakota &

Robinson, 1999; Croom, 2000; Deeter-Schemelz *et al.* 2001; Barnes *et al.* 2002); reduced paperwork and improved accuracy (Rammusson, 1999; Lancioni *et al.* 2000; Neef, 2001; de Boer *et al.* 2002); process re-design and elimination of tasks, reduced inventory, consolidated invoices and reduced transmission errors (Croom & Johnston, 2003).

Lancioni *et al.* (2000) argue that process configuration is significantly affected by the implementation of e-procurement. Croom (2000) suggests that the use of IT in automating data dependant tasks can reduce the number of stages in the purchase process. Furthermore, he contends that databases allow the configuration of the purchase process to be analysed over time and modified based on archiving of purchase data and modelling of alternative configurations.

Most authors appear in agreement that e-procurement implementation results in improvements to order cycle time (Croom, 2000; Turban *et al.* 2000; Zsidisin & Ellram, 2001; Harink, 2003). Cycle time may be reduced as a result of faster product search, fewer input errors, automatic authorisation within pre-set limits, faster delivery, fewer problems with invoice consolidation, and quicker payment to suppliers (Lancioni *et al.* 2000). This in turn creates the potential for reducing inventory levels and thus minimising working capital (Martin & Hafer, 2002; Presutti, 2003). However, it is worth noting that savings figures in the literature are generally anecdotal and in some cases costs of implementation may outweigh the potential advantages of e-procurement.

2.1.4 Impact on Price

In the procurement context, de Boer *et al.* (2002) define price as the expenditure on purchased goods or services. They split this into *direct* and *non-product related* (*NPR*) expenditure. Direct expenditure relates to an organisation's primary operations whilst *NPR* or *indirect* spending does not. Traditionally, the focus of procurement academics has been on direct, revenue-generating expenditure (Cox *et al.* 2005). However, given the percentage of total expenditure accounted for by *NPR* spending, there has been an increased awareness in this area. In fact, it is worth noting that for many service organisations, all procurement costs are indirect (de Boer *et al.* 2003).

There are a number of studies that report price savings accruing from e-procurement implementation. Croom and Johnston (2003) report a range of savings on the price of invoiced goods and services between 5% and 20%, averaging 17%. Based on data from 200 e-reverse auctions, de Boer *et al.* (2002) identify price reductions of between 10% and 15% for both direct and non-product related goods and services. Presutti (2003) suggests e-procurement implementation creates material savings of between 5% and 20%. KPMG (2000) report a survey of purchasing managers, indicating an average price saving of 8%, whilst *Essex County Council* report savings of 53% on a million-pound stationery contract.

Sources of Price Savings

Prior to purchase, e-sourcing enables buyers to identify more potential suppliers, increasing the availability of goods, thus reducing purchase price (Evans & Wurster, 2001; Croom & Brandon-Jones, 2005). For example, General Electric uses e-sourcing to search for potential new suppliers. The increase in supply base has allowed the firm to increase purchase leverage and realise price reductions of between 5% and 20% (Presutti, 2003). E-sourcing may be useful in leverage and bottleneck quadrants of the Kraljic matrix (de Boer *et al.* 2002), but this remains unproven.

Price savings are an important aspect of performance evaluation for e-reverse auctions. A number of authors discuss their role in reducing purchase price (de Boer *et al.* 2002; Jap, 2002; Martin & Hefer, 2002; Harink, 2003; Subramanian & Shaw, 2004; Wagner & Schwab 2004). Jap (2002) suggests that a key reason behind the growth of online reverse auctions is the significant price reductions that are often realised. Harink (2003) notes that e-reverse auctions are particularly beneficial to buyers in markets where supply exceeds demand. On-line reverse auctions have been extremely successful in reducing purchase prices – the typical price savings achieved is around 16% and these have been used for products as varied as foodstuffs, engineered components and utilities supplies (Croom & Brandon-Jones, 2005).

Post-purchase, improved management information is considered to be a major catalyst for reducing purchase prices through greater transparency of market prices, lower search costs and aggregation of requirements (Cox, 1999; Croom, 2000; Yen & Ng,

2003). This view is supported in practitioner and general management literature (Electronic Commerce News, 2003; Hayward, 2003; Moore, 2003; Parker, 2003; Trommer, 2003; Wheatley, 2003).

Finally, e-procurement creates significant opportunities for reductions in purchase prices through aggregation of requirements and economies of scale (Turban *et al.* 2000; Croom, 2000; Croom & Johnston, 2003). Croom (2000) gives an example of one respondent who reduced variety of office stationery from 235 to 38 items within two months of implementing e-procurement. **Table 1** summarises the sources of transaction and price savings that may arise through e-procurement implementation.

Table 1. Sources of Transaction & Price Savings

Area		Source	Kalakota & Robinson '99	Croom '00	Emiliani '00	Lancioni *et al.* '00	Turban *et al.* '00	Deeter-Schmelz *et al.* '01	Evans & Wurster '01	Neef '01	Zsidisin & Ellram '01	Attran & Attran '02	Barnes *et al* '02	DeBoer *et al.* '02	Jap '02	Martin & Hafer '02	Sashi & O'Leary '02	Croom & Johnston '03	Davila *et al.* '03	Harink '03	Min & Galle '03	Narasimhan *et al.* '03	Presutti '03	Smeltzer & Carr '03	Yen & Ng '03	Subramaniam & Shaw '04	Wagner & Schwab '04	Croom & Brandon-Jones '05
Transaction Costs	**E-Sourcing**	Economies of supplier search							x					x					x			x	x			x		x
	E-Tendering	Simplification of tendering												x														
	E-Reverse Auctioning	Reduced cycle-time			x										x									x			x	
		Reduced negotiation			x										x		x										x	
	E-MRO E-ERP	Reduced inventory									x	x		x		x		x			x	x	x	x				
		Reduced cycle time				x	x			x	x	x		x		x			x	x	x	x				x		
		Task elimination																										
		Invoice consolidation																x										
		Reduced error in transmission				x				x				x				x	x	x						x		
		Increased automation	x	x				x					x															
	E-Informing	Speed & accuracy of data collection		x																								
Purchase Prices	**E-Sourcing**	Increased supply base							x					x									x					x
	E-Reverse Auctioning	Contract price reduction			x									x	x	x	x		x					x		x	x	x
	E-MRO E-ERP	Aggregation of requirements		x			x			x		x				x		x			x		x			x		
	E-Informing	Market intelligence		x																					x			

2.1.5 E-Procurement Compliance

Within the literature, a number of authors note the importance of e-procurement compliance. The broad idea posited in these studies is that if compliance / adoption is limited, so too are the financial benefits of e-procurement (cf. Croom. 2000; Neef, 2001; Arbin, 2003, 2006; Croom & Johnston, 2003; Harink, 2003; Subramaniam and Shaw, 2004; Cox *et al.* 2005; Reunis & van Raaij, 2006).

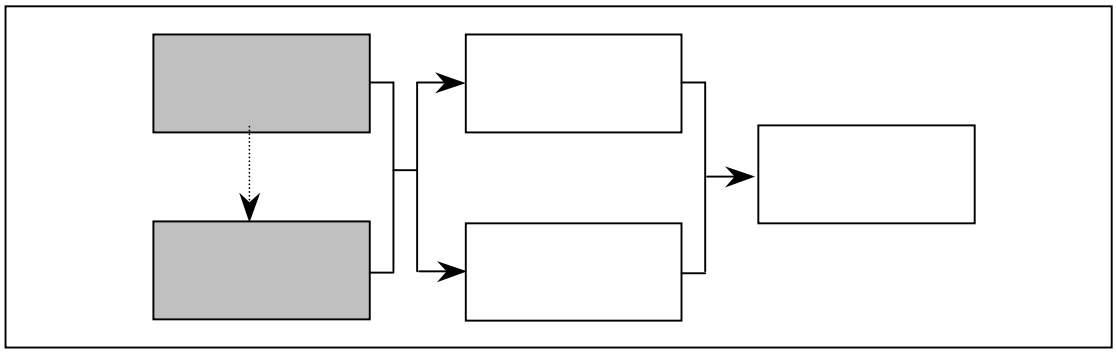
Arbin (2003, 2006) argues that if the potential value of investment is to be achieved, it is critical to get potential users to adopt e-procurement systems when purchasing goods and services. In examining influence tactics for e-procurement, Reunis and van Raaij (2006) note how attractive business cases 'evaporate' when user adoption is limited. They suggest that benefits are only achieved when individuals use systems and their contracts appropriately. Croom and Johnston (2003) argue that e-procurement enables purchasing departments to exert increased control over organisational procurement. In line with Neef (2001), they suggest that systems increase transparency and help to point users to the approved supplier or contract. Subramaniam and Shaw (2004) discuss the issues of increased control in ensuring appropriate use. As such, e-procurement implementation is seen to create the ideal conditions for reducing maverick spending (cf. Neef, 2001; de Boer *et al.* 2002; Croom & Johnston, 2003; Harink, 2003; Subramaniam & Shaw, 2004). The term incorporates the failure of individuals to use an e-procurement system when placing orders and the failure to use mandated contracts within the system. As such maverick spending is composed of two elements – *system compliance* and *contract compliance*.

System compliance may be defined as the extent to which internal customers actually use an e-procurement system to purchase goods and services (Croom & Brandon-Jones, 2005). It aids transaction cost reduction in a number of ways. The use of electronic documentation and process automation in e-procurement ensures high levels of accuracy in requisition, invoicing and payment (cf. Barnes *et al.* 2002). By comparison, orders placed outside of an e-procurement system are liable to transmission errors and require additional resources during invoice and payment (cf. Croom, 2000).

Contract compliance is focused on the extent to which individuals comply with mandated contracts within a system. As such, the term considers *how* an e-procurement system is used, as opposed to *if* it is used. Contract compliance affects transaction costs in various ways. The use of e-catalogues can significantly reduce processing times through the use of 'click boxes' and order 'cloning'. Additionally, multiple requisitions, from multiple budgets, but for the same supplier, can be aggregated into a single order. Croom and Johnston (2003) note that this reduces processing during receipt, invoice and payment. Contract compliance plays an even bigger role in price savings. The aggregation of requirements creates significant opportunities for price negotiation (cf. Turban *et al.* 2000; Croom, 2000). As contract use increases, so may the balance of power between the buyer and supplier. As such, contract compliance also may have a significant impact on pre-ordering activities.

In conclusion, the literature illustrates the importance of system and contract compliance in delivering the potential financial benefits of e-procurement **(Figure 6)**.

Figure 6. The Role of E-Procurement Compliance



2.1.6 The Role of *Perceived EPQ*

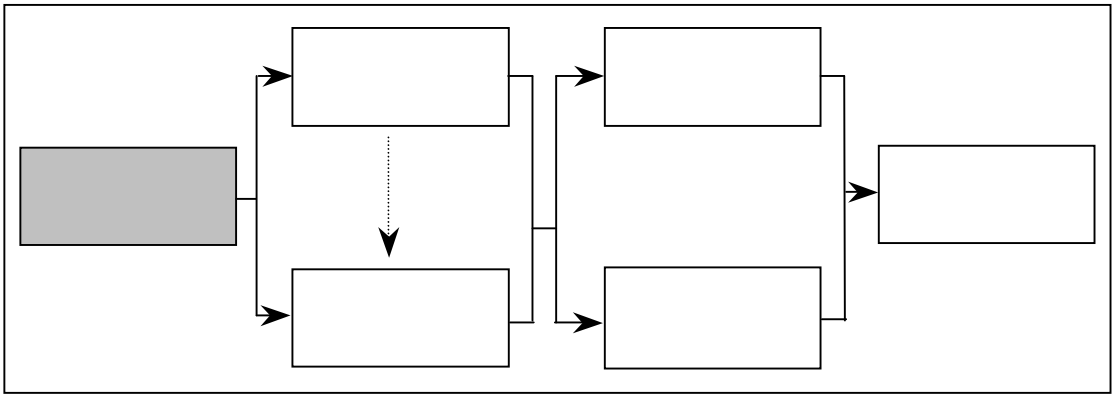
In some of the e-procurement literature, the reduction in maverick spending is taken as a given. However, others note the relationship between user perceptions of e-procurement delivery and the level of e-procurement compliance (cf.; Marshall *et al.* 1998; Kennedy & Deeter-Schmelz, 2001; de Boer *et al.* 2002; Croom & Johnston, 2003; Harink, 2003). High levels of system compliance may be aided by increased transparency that arises from e-procurement implementation (Neef, 2001; Subramaniam & Shaw, 2004). However, where internal customers have low

perceptions of e-procurement delivery, they will invariably find ways to circumvent official purchase processes (Oliver, 1993; Croom & Johnston, 2003). In addition, internal customers have a choice of *how* they do business within e-procurement systems. Contract compliance may be even harder to 'force' than system compliance (Marshall *et al.* 1998).

The motivation of buyers to use the internet as a resource for various elements of the purchasing process is investigated by Kennedy and Deeter-Schmelz (2001), who conclude that organizational characteristics and organizational influences are significant motivators to the use of e-procurement. Training and the relative influence of the purchasing function are both key factors influencing the uptake of e-procurement systems. Liao *et al* (2003) document the challenges for e-procurement implementation in terms of changing established procurement practices in the Taiwanese military. Their research highlights the significance of 'human deficiencies and faults (i.e. corruption and inefficiency) in the implementation process. Croom and Johnston (2003) argue that e-procurement compliance is strongly influenced by the general disposition of the organization as a whole to the potential benefits of e-procurement. They conclude that reduction in non-compliant actions by users is critical to the achievement of reductions in total procurement expenditure and thus internal service quality should be a key concern when implementing e-procurement.

It is worth noting that within the e-procurement literature, the relationship between perceptions of e-procurement and adoption is largely anecdotal. However, more broadly, there is empirical evidence to support the view that perceptions of technologies are positively related to user acceptance (Davis, 1989; Cowles & Crosby, 1990; Dabholkar *et al.* 1996; Szajna, 1996; Venkatesh *et al.* 2003). For example, Davis (1989) notes how perceived usefulness is correlated with self-reported usage of technology, whilst Szajna (1996) makes the connection between ease of use and actual usage. **Figure 7** illustrates how *Perceived EPQ* is related to elements of compliance within the literature.

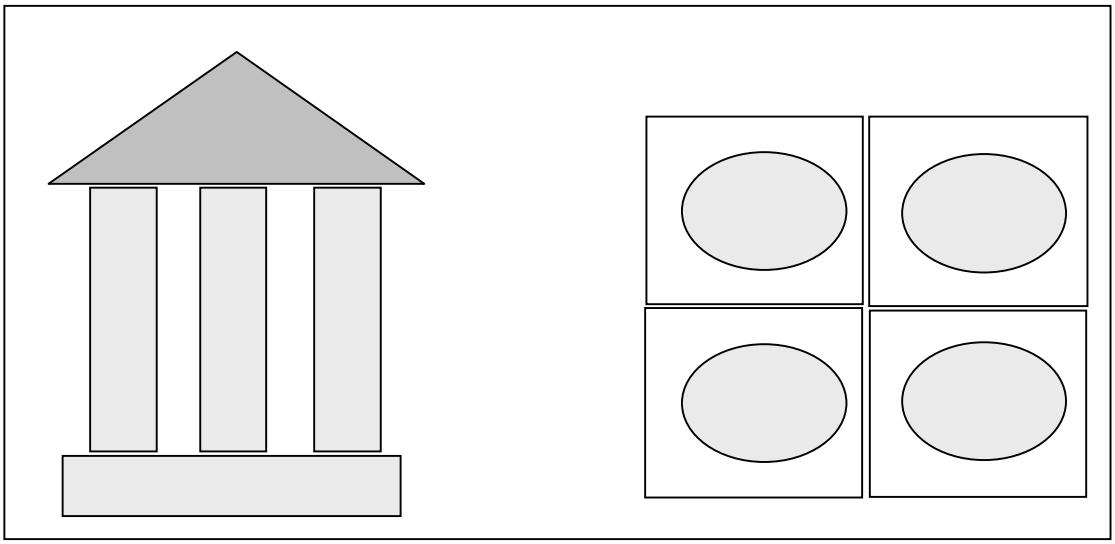
Figure 7. The Role of *Perceived EPQ*



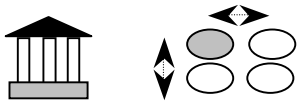
2.1.7 The Need to Explore *Perceived EPQ*

A review of e-procurement literature emphasises the financial impact of implementation, considering transaction costs and purchase price. In addition, the role of compliance in delivering these savings has been examined. Within the literature, *Perceived EPQ* is seen as an important driver of compliance. Empirical evidence for this relationship exists in *Information Systems* research. However, despite its importance in influencing e-procurement compliance, there has been no concerted effort to model *Perceived EPQ*. Given the paucity of research in the area, it is necessary to draw on other areas of literature in defining *Perceived EPQ* **(Figure 8)**. At an operational level, *Internal Service Quality, Information Systems Quality* and *E-Service Quality* literature can be seen as the pillars upon which the *Perceived EPQ* construct is largely based. In service measurement, these areas are all influenced by *Service Quality* literature, which provides the theoretical foundation for the study.

Figure 8. Literature Related to *Perceived EPQ*



2.2 Service Quality



With only around twenty-five years of research, *Service Quality* is a relatively young academic discipline. As such, there remains much debate over how best to define and measure service quality. According to the 'product-based' approach, quality reflects differences in measurable attributes of the product (Deming, 1982; Crosby, 1979). In this view, quality is measured by conformance of the product to a predetermined set of specifications. However, as noted by Parasuraman *et al.* (1985), the quality of services is difficult to measure objectively and it is perceptions of service quality which determine actions or loyalty. This section examines the difference between *satisfaction* and *service quality*, and the use of the *disconfirmation paradigm* in much service quality research. It then examines how various authors have delineated the construct. Finally, the important work of Parasuraman, Zeithaml and Berry (1985-1994) is discussed, including the ongoing debate over the validity of their *SERVQUAL* methodology and its application to various research contexts.

2.2.1 Service Quality & Satisfaction: Two Different Constructs

Zeithaml (1987) states that service quality can be defined as a customer's assessment of an entity's overall excellence. Whilst service quality is similar to the concept of satisfaction, it is also distinct from it (Parasuraman *et al.* 1988). The debate regarding the relationship between the two constructs appears to be reaching some form of consensus (Bitner & Hubbert, 1994; Caruana & Pitt, 1997). The distinction that is commonly made between satisfaction and service quality is that the former relates to the outcome of an individual service transaction whereas the latter refers to a long-term assessment of overall service delivery (cf. Oliver, 1981; Parasuraman *et al.* 1988; Bitner 1990; Carman, 1990; Bolten & Drew, 1991; Boulding *et al.* 1993; Oliver, 1993; Patterson & Johnson, 1993; Taylor, 1992; Zeithaml *et al.* 1993, Cronin & Taylor, 1994; Johnston, 1995a, 1995b; Caruana & Pitt, 1997). Satisfaction and service quality are conceptually related in that the accumulation of transaction-specific incidents over time determine overall service quality perceptions (Parasuraman *et al.* 1988). Carman (1990) suggests that a customer references several

'moments of truth' in the service encounter when assessing service quality. These transaction-specific moments of truth combine to form service quality perceptions.

2.2.2 Service Quality at a Theoretical Level

The *disconfirmation paradigm* (Oliver, 1980; Cadotte *et al.* 1987) states that service perceptions are determined by the gap between previously held expectations and perceptions of performance. Disconfirmation is positive when performance exceeds expectations and negative when it falls short of expectations (Ganesh *et al.* 2000). Lewis and Booms (1983) are among the first to define service quality as the extent to which service delivery matches customer expectations. However, Grönroos (1982) implicitly adopts *disconfirmation theory* in the perceptions-minus-expectations view of service quality, referred to as 'Gap Theory' (Hill & McCrory, 1997).

Oliver (1997) argues that *assimilation* and *contrast* effects significantly influence the disconfirmation process. Assimilation effects relate to the importance of previously held expectations in anchoring performance assessments. Therefore, the extent and nature of customer experience is critical in the disconfirmation process (Cadotte *et al.* 1987). Additionally, assimilation effects are particularly important when the level of performance is ambiguous (Ganesh *et al.* 2000). Contrast effects relate to the extent to which customers magnify perceptions ratings in line with the direction of disconfirmation (Oliver, 1997). Customers may over-emphasise positive or negative disconfirmation by indicating extreme performance ratings.

The contention that service quality is determined by a comparison between expected and perceived service is supported by many academics (cf. Grönroos, 1984; Parasuraman *et al.* 1985; Brady & Cronin Jr., 2001; Johnston & Clark, 2005). Unlike *objective quality*, which involves a mechanistic assessment, *perceived quality* relates to the subjective response of an individual to an event or entity (Parasuraman *et al.* 1988). As a result, it is highly relativistic and varies from one person to the next. There are some issues in defining a construct as the difference between two other constructs (Peter *et al.* 1993). A number of authors argue that service quality is best underpinned by *attitudinal theory* (cf. Cronin & Taylor, 1992, 1994; Peter *et al.* 1993;

Smith, 1995; Brady *et al.* 2002). In adopting the disconfirmation model, there may be a 'muddying the waters' in terms of the difference between satisfaction and service quality. Parasuraman *et al.* (1994a) reject conceptualising service quality as an attitude rather than a disconfirmation process. They note that customer assessments invariably occur relative to some norm (p112). The disconfirmation paradigm is now the dominant view in service quality literature and is a widely used departure point for many researchers seeking to model the construct (Brooks *et al.* 1999).

2.2.3 Service Quality at an Operational Level

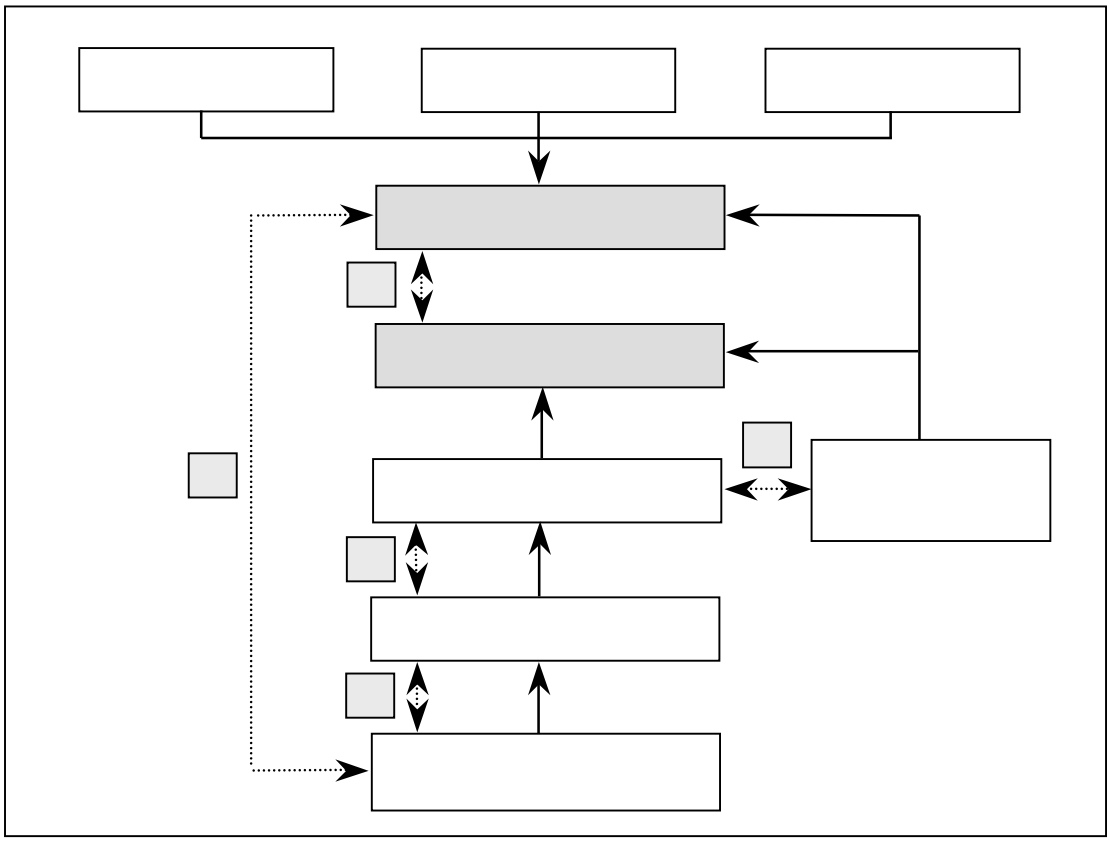
Whilst the majority of service research is underpinned by disconfirmation theory at a cognitive level, there are a wide variety of approaches in measuring service quality at an operational level. There remains considerable debate over how the best to delineate the service quality construct (Jones & Suh, 2000). Attempts to examine the criteria used by customers in assessing service quality have produced different sets of dimensions in various research settings (Johnston, 1994). Brady and Cronin Jr (2001) posit two broad service quality perspectives – the *'Nordic'* and the *'American'*.

The *'Nordic'* perspective (Grönroos, 1982, 1984) defines service quality dimensions in global terms. *'Technical quality'* refers to what a customer receives, whilst *'functional quality'* is concerned with how the service is delivered. Other authors have built on this theme. For example, Lehtinen and Lehtinen (1982) suggest three dimensions - *physical quality, corporate quality* and *interactive quality.* Hedvall and Paltschink, 1989) propose two dimensions – *'willingness and ability to serve'* and *'physical and psychological access'.* Rust and Oliver (1994) develop a three-component model including *service product, service delivery,* and *service environment.* The *'American'* perspective applies terms to describe the various aspects of the service encounter (e.g. *reliability, responsiveness, assurance, empathy,* and *tangibles*) and has been widely applied through applications of the *SERVQUAL* scale (Parasuraman *et al.* 1988). Given the wide application and testing of the *'American'* perspective in measuring service quality, the seminal work of Parasuraman *et al.* (1985-1994) is now examined in more detail.

2.2.4 Measuring Service Quality – The *'American'* Perspective

Parasuraman *et al.* (1985) state that service quality has three distinct properties - *search, experience* and *credence.* Search relates to the characteristics of a service, which will entice a consumer to make a purchase. Experience considers elements of service quality delivered during or shortly after the purchase of a service. Credence properties are aspects of service that are difficult to evaluate even post-purchase/experience (e.g. a surgeon's competence). Similar distinctions are made by Heskett *et al.* (1990) and Zeithaml (1991). Because services have few search properties and it can be difficult to assess credence properties, Parasuraman *et al.* (1985) argue that 'consumers typically rely on experience properties when evaluating service quality'. Parasuraman, Zeithaml, and Berry's research involves the development of a conceptual model of service quality and the development of *SERVQUAL* to measure the construct. Based on interviews with executives in four U.S. service organisations and focus groups with customers, they present the gap model of service quality **(Figure 9)**.

Figure 9. GAP Model



(Parasuraman *et al.* 1985)

- Gap 1: Consumer expectations minus management perceptions. Managers fail to understand the expectations of their customers.

- Gap 2: Service specification gap. Failure of management to translate their understanding of customer expectations into appropriate service specifications that could deliver on such expectations.

- Gap 3: Not adhering to service specification. Regardless of whether appropriate service specifications exist, contact personnel may not actually deliver high levels of service to customers.

- Gap 4: Mismanaging customer expectations. Occurs when external communications to customer promise more than an organisation is able to deliver.

The four service-provider gaps combine to create a fifth gap – the gap between expected service and perceived service. Parasuraman *et al.* (1985) propose that service quality is a form of overall evaluation and is a function of the magnitude and direction of gap 5 (*SQ = Gap 5 = P-E*). In turn, gap 5 is determined by the nature of the service-provider gaps associated with the design, marketing, and delivery of services (*GAP 5 = f (GAP 1, 2, 3, 4)).*

Later research by Parasuraman *et al.* (1988, 1991a, 1991b, 1994a, 1994b) delineates service quality (Gap 5) into constituent components. Initial scale development proposes ten dimensions – *reliability, responsiveness, tangibles, access, understanding, competence, courtesy, communication, credibility,* and *security.* Subsequent research based on data from four U.S. firms identifies a high degree of correlation between *access* and *understanding*, on one hand, and *competence, courtesy, communication, credibility,* and *security* on the other. As a result, the authors propose a final set of 22 items within five dimensions - *reliability, responsiveness, tangibles, assurance,* and *empathy.* The *SERVQUAL* scale is based on these 5 dimensions, with 22 paired expectations and perceptions statements.

SERVQUAL is the most widely used and tested measurement tool in the *Service Quality* literature (Buttle, 1996; Davis *et al.* 1999). The majority of *SERVQUAL* application has occurred in the for-profit sector. However, the tool has also been used to measure service delivery in public and *NPO* settings. Whilst *SERVQUAL* has been extensively applied in a variety of contexts, there remains significant debate over the efficacy of the scale at both a theoretical and operational level. There follows a discussion of theoretical underpinning, content validity, construct validity, and predictive validity of *SERVQUAL*, based on replications in external service settings.

2.2.5 Theoretical Underpinning of *SERVQUAL*

In line with most service quality research, the *SERVQUAL* scale is underpinned by disconfirmation theory. Devlin *et al.* (1993) argue that measuring service relative to expectations is the most appropriate and least biased approach. Whilst the paradigm is dominant within the literature (Boshoff & Gerhard, 1995; Brooks *et al.* 1999; Silvestro, 2005), there remain questions over the applicability of disconfirmation theory in modelling service quality (Peter *et al.* 1993).

A number of authors question the validity of *SERVQUAL* on the basis of its theoretical underpinnings (Anderson, 1992; Cronin & Taylor, 1992 & 1994; Brown *et al.* 1993; Peter *et al.* 1993; Teas 1993 & 1994; Brady *et al.* 2002;). Some suggest that a direct measure of service quality based on attitudinal theory is more appropriate. For example, Cronin & Taylor (1992, 1994) challenge the validity of the P-E approach, instead positing a performance-based measure of service quality – a view that is supported by Smith (1995). However, Parasuraman *et al.* (1994a) emphasise the fact that their research provides strong support for defining service quality as the gap between expectations and perceptions (p111). They also note the work of other authors (cf. Grönroos, 1982; Lehtinen & Lehtinenen, 1982) that supports the disconfirmation view of service quality. Clearly, a debate remains over the most appropriate theories on which to model service quality.

Considering e-procurement, the limited e-procurement quality research necessitates the examination of both expectations and perceptions, pointing to the application of

disconfirmation theory in the study. The diagnostic value of the disconfirmation approach is noted by numerous authors (cf. Parasuraman *et al.* 1994a; Kettinger, 1994). Therefore, it is argued that *Perceived EPQ* is best defined as a disconfirmation between expectations and perceptions.

2.2.6 Content Validity of *SERVQUAL*

Content validity is a qualitative assessment by experts of how well a scale measures a concept. Content validity is determined by how the scale is developed and how well scale items adequately represent the domain of the concept.

The development of the *SERVQUAL* scale is based on procedures recommended by Churchill (1979). As such, the authors claim to have followed a rigorous and thorough method in delineating service quality (Parasuraman *et al.* 1988). Technically, ordinal scales should not be used in interval techniques such as factor analysis and regression (Anderson, 1992), but in reality it is usually impossible to collect interval data regarding customer perceptions. Flynn *et al.* (1990) and Sekaran (2003) both note the use of Likert scales in all forms of data analysis is widespread.

Parasuraman *et al.* (1988) propose that the *SERVQUAL* items represent service quality in a wide range of settings. They argue that the final 22 items 'have sound and stable psychometric properties' (p24) and are generically applicable. However, they also note that in their quest to produce a tool that is widely applicable, 75 of their original 97 items were deleted. The authors accept that, 'this procedure may have deleted certain "good" items relevant to some, but not all firms.' Parasuraman *et al.* (1988) claim that *SERVQUAL* acts as a basic skeleton for measuring service quality and that with minor modifications, the tool is appropriate for use in a broad range of service contexts. They accept that the scale can be supplemented with context-specific items, but warn that, 'the new items should be similar in form to the existing *SERVQUAL* items.' A number of academics have questioned how applicable the original 22 items are in measuring service quality in a range of industries, pointing to the need to add context-specific items to adequately measure service quality (Buttle, 1996).

Johnston *et al.* (1990) assess the comprehensiveness of the *SERVQUAL* dimensions in UK service organisations. While generally supportive of the original ten dimensions, the authors suggest a refined list of 12 determinants: *reliability, responsiveness, appearance/aesthetics, comfort, cleanliness/tidiness, communication, security, competence, courtesy, friendliness, access, availability*. A further five quality determinants – *attentiveness/helpfulness, care, commitment, functionality,* and *integrity* – are added to this list in later work (Silvestro & Johnston, 1992). In four different service settings, Carman (1990) adds up to 13 additional items and deletes as many as 14 from the *SERVQUAL* scale. Bouman and Van der Wiele (1992) use 48 service quality items in their research, whilst Saleh and Ryan (1991) use 33. In his analysis of software house service quality, Fort (1993) uses 31 items, whilst Babakus and Mangold (1992) use 15 in their hospital research.

In addition, there is a concern that the *SERVQUAL* tool focuses too heavily on service experience, with little attention given to the service outcome (cf. Mangold & Babakus, 1990; Cronin & Taylor, 1992; Richard & Allaway, 1993; Bowers *et al.* 1994). In researching Domino's Pizza, Richard and Allaway (1993) augment the 22 *SERVQUAL* items with six outcome items:

1. Domino's has delicious home-delivery pizza.
2. Domino's has nutritious home-delivery pizza.
3. Domino's home-delivery pizza has flavourful sauce.
4. Domino's provides a generous amount of toppings for its home-delivery pizza.
5. Domino's home-delivery pizza is made with superior ingredients.
6. Domino's prepared its home-delivery pizza crust exactly the way I like it.

By adding these extra items, the power of the tool in predicting customer loyalty improves from 45% to 71.5%. Bowers *et al.* (1994) include two outcome-specific factors, *caring* and *patient outcomes*, which they believe are not adequately incorporated in the original *SERVQUAL* scale. In defence of *SERVQUAL*, Higgins *et al.* (1991) argue that outcome quality is considered in three of the original ten dimensions – *reliability, competence* and *security*. Carman (1990), Finn and Lamb (1991) and Brown *et al.* (1993) all conclude that there are serious omissions to *SERVQUAL*, and that the five dimensions may not be sufficiently complete to cover

service quality in different industries. Dabholkar *et al.* (1996) and Van Dyke *et al.* (1997) go further, arguing that it is not appropriate to use a single measure of service quality across different service settings.

In conclusion, the development of the *SERVQUAL* scale, whilst following recommended procedures (Churchill, 1979) may have resulted in deletion of items which are relevant to certain service settings. The numerous replications indicate that, whilst *SERVQUAL* provides a useful departure point for measuring service quality, there are many research settings where significant modification is required to provide useful data. Finally, the emphasis on experience appears to be a limitation, especially in research settings where there is a clear service outcome.

2.2.7 Construct Validity of *SERVQUAL*

It is important to examine if the five *SERVQUAL* dimensions are conceptually and empirically distinct. Construct validity (convergent and discriminant) can be inferred if scale replications produce the same factor structure as theorised by Parasuraman *et al.* (1988).

Convergent Validity

Convergent validity is indicated if items load on factors as expected (Bagozzi, 1981). Parasuraman *et al.* (1988) point to the fact that individual items have high loadings on their assigned dimensions as evidence of convergent validity. The authors also note that factor analysis presents consistent findings across four different data sets. Finally, high reliability coefficients for each dimension (.52 to .87) provide further evidence of convergence[3].

In contrast to the original research, empirical testing raises concerns over the convergent validity of *SERVQUAL*. For example, Carman (1990) identifies a number of items that do not load as theorised in different service contexts. Two of *empathy*

[3] Whilst questions over the use of Cronbach alphas in assessing difference scores exist (Spreng & Singh, 1993; Van Dyke, 1997), there is little difference between these scores and reliability calculations specifically designed for gap scores (Parasuraman *et al,* 1993; Pitt *et al.* 1997).

items load on the *tangibles* dimension (dental clinic); one *empathy* item loads on *security* (tyre retail); an item relating to ease of making appointments loads on *reliability* in dental study, but *security* in the tyre retail setting. Additionally, in different service settings, a number of items do not load on any factor. Likewise, Babakus and Boller (1992), show two *responsiveness* items and two *empathy* items load on a single factor, whilst other items fail to load on factors as expected. They conclude that Bagozzi's (1981) rules for convergence do not hold true for the *SERVQUAL* scale. In a study of service quality in the public sector, Orwig *et al.* (1997) find little evidence to support the 5-dimensional structure of *SERVQUAL.* Loadings for all items are very low, *tangibles* items split into two factors, and two *responsiveness* items load on *reliability.*

In addition, they are some concerns related to the issue of *polarity.* Scale development literature often advocates a mix of positive and negative statements (Churchill, 1979), to ensure respondents think carefully about their answers. However, mixed wording in scales can create confusion among respondents (Watson and Johnson-Laird, 1972) and may create *'method factors'* (Babakus & Boller, 1992). Babakus notes that the *responsiveness* and *empathy* dimensions in the *SERVQUAL* scale are comprised entirely of negatively worded items. Descriptive data shows large and significant differences in both expectations and perceptions scores for items worded positively and negatively. Furthermore, their factor analysis produces a two-factor solution, with all positive items in factor 1 and all negative in factor 2. The authors conclude that 'the differences in the results may be partly due to item wording.' (p262).

Babakus and Boller (1992) and Babakus and Mangold (1992) argue that as a result of method problems, only positively-worded statements should be used in measuring service quality. Carman (1990) agrees, stating that, 'the disadvantages of including reversed items probably outweigh the advantages.' (p42). In their review of *SERVQUAL*, Parasuraman *et al.* (1991b) re-phrase all negatively-worded questions. However, the question remains as to the extent to which *SERVQUAL* dimensions have emerged as a result of their content or the way items were originally worded.

Discriminant Validity

Discriminant validity is determined if factors are distinct from one another (Bagozzi, 1981; Carman, 1990). Parasuraman *et al.* (1988) show that with a few exceptions, items do not load on more than one factor. Furthermore, the distinction between the five factors is supported by the relatively low inter-correlations between the factors, ranging from .21 to .35 across five data sets. However, replications reveal limited empirical support for the five *SERVQUAL* factors.

Carman (1990) identifies between 5 and 9 factors across different service settings, including *admission, tangible accommodation, tangible food, tangible privacy, nursing, explanation, visitor access/courtesy, discharge planning,* and *patient accounting.* He is particularly critical of Parasuraman *et al.* (1988) combining the *understanding* and *access* factors from their original work into the *empathy* dimension. Carman concludes that the ten original dimensions are more appropriate for use in service quality research than the five used in *SERVQUAL*.

Saleh and Ryan (1991) identify five factors of service quality in a hotel setting. However, the first two factors – *conviviality* and *tangibles* – account for 69.7% of variance, while the remaining three factors – *reassurance, avoid sarcasm,* and *empathy* – account for just 8.9% combined. The researchers argue that their analysis fails to confirm the *SERVQUAL* dimensions, suggesting instead a two-factor solution in the hospitality industry. Similarly, in analysis of data from utility companies, one factor accounts for 66.3% of variance, leading to the conclusion that service quality is essentially uni-dimensional for utility customers.

Cronin & Taylor's (1992) confirmatory factor analysis of data from multiple service organisations, indicate a poor fit for the proposed five-factor structure. Likewise, in a study of car servicing, Bouman and van der Wiele (1992) find little evidence of the proposed *SERVQUAL* factors. Instead, they identify three factors of service quality – *customer kindness, tangibles* and *faith.* Babakus *et al. (*1993) state that 'with the exception of findings reported by Parasuraman and his colleagues, empirical evidence does not support a five-dimensional concept of service quality.'

Spreng and Singh (1993) note a high level of correlation between the *SERVQUAL* factors. The correlation between *assurance* and *responsiveness* was 0.97, and 0.87 between their combined *assurance-responsiveness* dimension and *empathy*. These high levels of correlation suggest that the dimensions are not separable in some research settings. Parasuraman *et al.* (1991b) note a similar problem when replicating *SERVQUAL*. By constraining analysis to a five-factor solution, *tangibles* splits into two dimensions, whilst *responsiveness* and *assurance* items combine to form a single factor. When six factors are considered, the solution generated distinct *responsiveness* and *assurance* dimensions. The authors now accept that the five *SERVQUAL* dimensions are interrelated. However, they defend the dimensionality of *SERVQUAL*. They argue that differences in the number of factors derived in replication studies may be a result of differences in methods of data collection or analysis, and specific customer evaluations in each research setting masking the true nature of service quality dimensions.

Both Carman (1990) and Babakus and Boller (1992) suggest that the number of service quality factors may be determined by the service setting. Carman (1990) states, 'when one of the dimensions of quality is particularly important to customers, they are likely to break that dimension into sub-dimensions.' (p37). In some service settings, service quality may be defined by many factors, whilst in others it may be essentially uni-dimensional (Babakus & Boller, 1992). Babakus *et al.* (1993) suggest that the dimensionality of service may be determined by the level of involvement in an industry. Where the service is low-involvement (e.g. utility service) and service delivery is ongoing, service quality is likely to be defined by fewer dimensions.

In conclusion, the review of literature suggests that there are serious concerns regarding the construct validity of the *SERVQUAL* scale. It is clear that items do not always load on their theorised factors. In addition, there is overwhelming evidence against the view that the five *SERVQUAL* dimensions are generic. This appears to largely as a result of method factors, caused by mixed wording in the original scale explication.

2.2.8 Predictive Validity of *SERVQUAL*

The ability of a scale to predict variation in related (criterion) variables is important for establishing *predictive validity* (Flynn *et al.* 1990). Parasuraman *et al.* (1988) use multiple regression analysis to establish the power of the *SERVQUAL* scale in predicting *'overall quality perceptions'* on a scale of 1-4. Adjusted R^2 values are all significant and indicate that *SERVQUAL* explains between 27% and 52% of variance in *'overall quality perceptions'* across four different service settings. In all the settings, *reliability* and *assurance* were the first and second most important dimensions in prediction. *Tangibles* and *responsiveness* were next most important dimensions, in different order depending on the setting. The *empathy* dimension was consistently the least important in influencing *'overall quality perceptions'* (Parasuraman *et al.* 1988). Bolten & Drew (1991) support these claims, findings prediction scores between .25 and .43.

The Practical Value of Gap Scores

Whilst disconfirmation is viewed by many as an appropriate theoretical underpinning for service quality, there remain questions over the best way to operationalise this cognitive process. The question is 'what is the benefit of a difference score over a direct measure?' Babakus and Boller (1992) suggest that whilst service quality measurement based on perception-expectation gaps is intuitively appealing, 'difference scores do not provide any additional information beyond that already contained in the perceptions component of the *SERVQUAL* scale.' The authors find that the correlations between *SERVQUAL*, *overall ratings* and *complaint resolution* are simply weaker versions of the correlations between perceptions and these dependent variables. A study by Parasuraman *et al.* (1993) compares the predictive power of difference scores and perceptions-only scores through multiple regression analysis. R^2 scores for *SERVQUAL* range from .51 to .71, whilst perceptions-only scores are .72 to .81. Likewise, Brown *et al.* (1993) find higher correlations between behavioural intentions and perceptions-only scores (.31) than with difference scores (.26). Other authors also question whether gaps scores are useful in measuring the outcome of cognitive discrepancy (Cronin and Taylor, 1994; Iacobucci *et al.* 1994; Van Dyke *et al.* 1997).

There are several possible weaknesses with the expectations element of *SERVQUAL*. A number of authors have noted that expectations scores are illusory because the most likely response to statements on service delivery is 'strongly agree' (Carman, 1990; Babakus & Boller, 1992; Reynoso & Moores, 1995). In supporting this argument, Babakus and Inhofe (1991) suggests that customers are driven by the "I-have-high-expectations' social norm and this creates a bias towards social desirability. The tendency to rate expectations consistently highly means that perceptions tend to be the dominant contributor in the gap score (Babakus & Boller, 1992) and therefore the benefit of collecting separate expectations data is questioned (Cronin & Taylor, 1992 & 1994; Boulding *et al.* 1993; Brown *et al.* 1993). This concern is bourn out by the very high reported averages for expectations in a number of studies. Van Dyke *et al.* (1997) comment on this problem stating that because most expectations items are vector attributes (i.e. more is always better), the tendency towards extreme responses increases and with that the value of expectation scores diminishes.

If one decides to examine expectations separately from perceptions, there is a need to determine the *type* of expectations being measured. Teas (1994) notes that the definition of expectations for the *SERVQUAL* model have been defined in a great many ways: desires, wants, normative expectations, desired service, the level of service a customer hopes to receive, and what a service provider should possess (Parasuraman *et al.* 1985, 1988, 1991b; Zeithaml *et al.* 1993). The variety of definitions for expectations may create a loosely defined conceptualisation of service quality (Cronin & Taylor, 1994). Teas (1993a) argues that a considerable amount of measurement error is caused by the different ways which customers define expectations.

Parasuraman *et al.* (1991b, 1994a) have responded to the concern regarding the definition of expectations by redefining expectations as the service a consumer would expect from 'excellent service organisations'. However, there are also issue over the failure to assess customer expectations based on absolute, rather than relative, standard of service (Buttle, 1996). Service quality is deemed satisfactory if there is no gap between expectations and perceptions. Grönroos (1983) explores this 'service paradox' that lower expectations make delivery of 'satisfactory service' easier.

There are also some concerns regarding the validity of expectations scores that are collected at the same time as perceptions scores - contemporaneously (Carman, 1990) or measured when they are not clearly formed (Carman, 1990; Iacobucci *et al.* 1994). Kahneman and Miller (1986) suggest that consumers may form their expectations as a result of the service provided rather than prior to it – they call these 'experience-based norms.' Clow and Vorhies (1993) suggest that unless expectations data is collected before the service delivery it is of questionable use. They argue that post-service expectations scores are strongly influenced by customer perceptions of services. Customers who are happy with the service tend to understate expectations, whilst dissatisfied customers will tend to over-inflate expectations. However, Carman (1990) notes the impracticality of collecting expectations and perceptions data at different times. So we are faced with a catch-22 situation! Finally, a number of authors have noted the boredom factor of two administrations, one for expectations and the other for perceptions (Bourman and van der Wiele, 1992). There is a danger that this boredom will damage the reliability of the data collected.

Direct Measurement of Service Quality

In response to concerns over the practical value of expectations data, Cronin & Taylor (1992, 1994) propose a performance-only approach to service quality measurement. *SERVPERF* uses the same 22 perception items as *SERVQUAL*, but does not include the set of expectations statements. Their research indicates that a perceptions-only measure of service quality tends to have better predictive validity than a gap approach.

Parasuraman *et al.* (1994a) accept that performance-only measures of service quality do appear to more accurately predict *'overall quality'*. However, they argue that the improvement in predictive accuracy comes at the cost of diagnostic value. They state that '*SERVQUAL* could be superior in terms of pinpointing areas of deficiency within a company'. Dean (1999) concurs with this view and supports the use of gap scores in measuring service quality because of its diagnostic value. This highlights the importance of considering the practical value of a scale when making assessments of scales. Furthermore, Parasuraman *et al.* (1994b) suggest that direct measures of service quality may suffer from over-inflation of customer service ratings. They argue that evidence from a number of authors shows an upward bias in direct measures of

service quality compared with difference-score measures (Peterson & Wilson, 1992; Liljander & Strandvik, 1992, 1993; Brown *et al.* 1993).

Carman (1990) agrees that expectations are important. He suggests that one solution to the problems with the expectations element of *SERVQUAL* is to collect data regarding the perceptions-expectation gap in single statements – e.g. *'The visual appeal of XYZ's physical facilities is - much better; better; about the same; worse; much worse - than I expected'*. He argues that this approach is particularly appropriate where expectations are well established, stating that, 'In the absence of major change in the service delivery, expectations information might be collected as infrequently as once every third year.' (p49) Babakus and Boller (1992) and Babakus *et al.* (1993) support this notion and suggest a scale ranging from 1 = 'greatly falls short of my expectations' to 7 = 'greatly exceeds my expectations'. They argue that not only would this make the questionnaire easier to complete, it would also reduce the confusion caused by referring to a whole industry in the expectations section of *SERVQUAL* and to a specific company in the perceptions section.

In conclusion, evidence of predictive validity for the *SERVQUAL* scale has been partially demonstrated in the literature. However, there are clearly concerns over the *practical* merits of measuring the disconfirmation process through a gap (P-E) approach. It is important that the type of expectations being measured is explicit, to ensure reliable data. Perceptions-only measures marginally outperform gap measures in predicting dependent variables. However, one must consider the loss of diagnostic value caused by not measuring service expectations, especially where expectations are not well understood or liable to change.

2.2.9 Conclusion on *SERVQUAL* in an External Setting

Table 2 provides a summary of key findings from various *SERVQUAL* replication studies in an external setting. The table highlights the areas where most authors have critiqued the work of Parasuraman, Zeithaml, and Berry.

Table 2. *SERVQUAL* Applications in *Service Quality* Literature

Study	Instrument	Analysis	Factor Structure
Brensinger & Lambert '90	22 original items	*PAF* by oblique rotation	4 factors with eigenvalues >1
Carman '90	4 scales. 12-21 original items	*PAF* by oblique rotation	Between 5 and 9 factors, suggest factors determined by service setting
Finn & Lamb '91	22 original items	*CFA*	5-factor model with poor fit
Parasuraman *et al.* '91b	22 original items	*PAF* by oblique rotation	5 factors, but different from *a priori* model. *Tangibles* split into 2 factors, while *Responsiveness* and *Assurance* form 1 factor
Saleh & Ryan '91	22 items + 11 additional	Factor approach not stated	5 factors, but first 2 account for 69.7% of variance, suggesting 2-factor solution
Babakus & Boller '92	22 original items	*PAF* by oblique rotation, followed by *CFA*	5-factor model not supported. 2-factor model identified. Possible method factors (all +ve/-ve)
Babakus & Mangold '92	15 of 22 original items	*PAF* by varimax rotation	1 factor: SQ is uni-dimensional
Bourman & Van der Wiele '92	48 items based on *SERVQUAL* dimensions	*PAF* by varimax rotation	3-factor model (12 based on eigenvalues >1)
Cronin & Taylor '92	22 original items	*PAF* by oblique rotation	1 factor: SQ is uni-dimensional
Silvestro & Johnston '92	12 from Johnston '90	CIT	17 determinants, dimensionality not examined
Babakus *et al.* '93	22 original items	*PAF* by oblique rotation	Dimensionality of SQ determined by involvement
Richard & Allaway '93	22 items + 6 outcome items	Factor approach not stated	6 factors (5 *SERVQUAL*) plus *Outcomes* factor
Bowers *et al.* '94	22 original items	Factor approach not stated	12 factors, including 2 outcome-related factors
Orwig *et al.* '97	22 original items	*PCA* by varimax rotation	6 factors, little support for *SERVQUAL*
Engelland *et al.* '00	22 items + 50 additional	*CFA*	Original model not supported. 5 modified factors: 17 items (8 from *SERVQUAL*)
Jabnoun *et al.* '03	39 items based on 10 (PZB '85) dimensions	*PAF* by varimax rotation	5 factors, similar meanings
Arasli *et al.* '05	21 of 22 original items	*PAF* by varimax rotation	3 factors
Lau *et al.* '05	22 items + 3 extra items	*SERVQUAL* not validated	5 factors taken as given

PAF – Principal Axis Factor Analysis
PCA – Principal Components Factor Analysis
CFA – Confirmatory Factor Analysis

The debate regarding the efficacy of *SERVQUAL* for service quality measurement has failed to reach a consensus (Stanley & Wisner, 1998). This study supports the view that defining service quality using disconfirmation theory is appropriate. At an operational level, there remain major concerns over the content validity, given the modification usually required and the over-emphasis on service experience.

Therefore, whilst *SERVQUAL* items provide a useful list of attributes in the first instance (Rust *et al.* 1995), exploratory work in specific research settings appears necessary to identify appropriate service quality variables. There are also serious concerns regarding construct validity. Due to the nature of the service setting and the impact of mixed wording in development, there is limited evidence to support the 5-dimensional structure of *SERVQUAL*. Finally, whilst there is some evidence of predictive validity in the literature, questions remain over the practical value of paired-statements in service quality measurement. Given the fact that many expectations variables are vector attributes, perceptions scores tend to play a dominant role in prediction. However, in research settings where expectations are not well understood or liable to change, there is a strong case for initially collecting separate expectations and perceptions data.

In conclusion, the view that service quality is defined as a disconfirmation between service expectations and perceptions has broad *conceptual* support within the literature. However, there are clearly many issues with the *SERVQUAL* scale in terms of content, construct and predictive validity. In developing a measure of *Perceived EPQ*, it may not be appropriate to simply replicate the *SERVQUAL* scale.

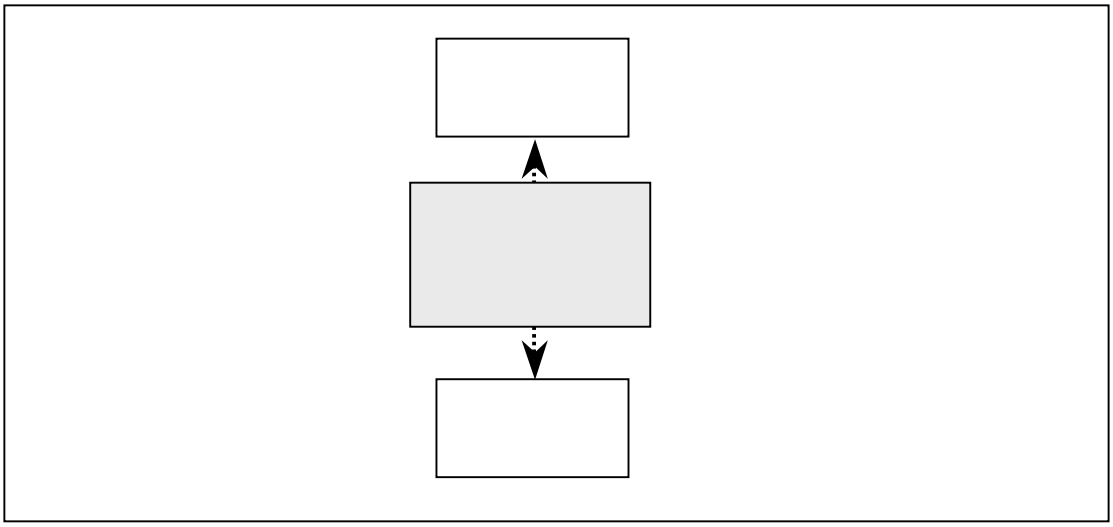
Summary

This chapter started by examining e-procurement literature relevant to the study. Much of the work to date has focused on how e-procurement implementation affects expenditure and the role of user compliance in driving these financial benefits. However, despite the fact the *Perceived EPQ* is seen as an important driver of both system and contract compliance in the literature, the construct remains relatively unexplored.

In seeking to understand how *Perceived EPQ* may best be conceptualised, *Service Quality* literature has been examined. Much of the research is underpinned by disconfirmation theory and the study supports this approach to modelling *Perceived EPQ* **(Figure 10)**. Whilst the *SERVQUAL* scale provides useful ideas for *EPQ Scale*

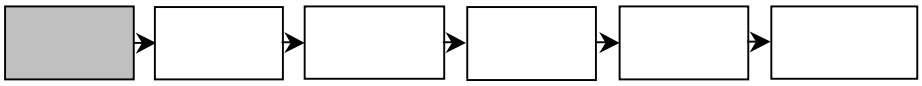
development, operational limitations mean that a simple replication may be inappropriate.

Figure 10. Modelling *Perceived EPQ*



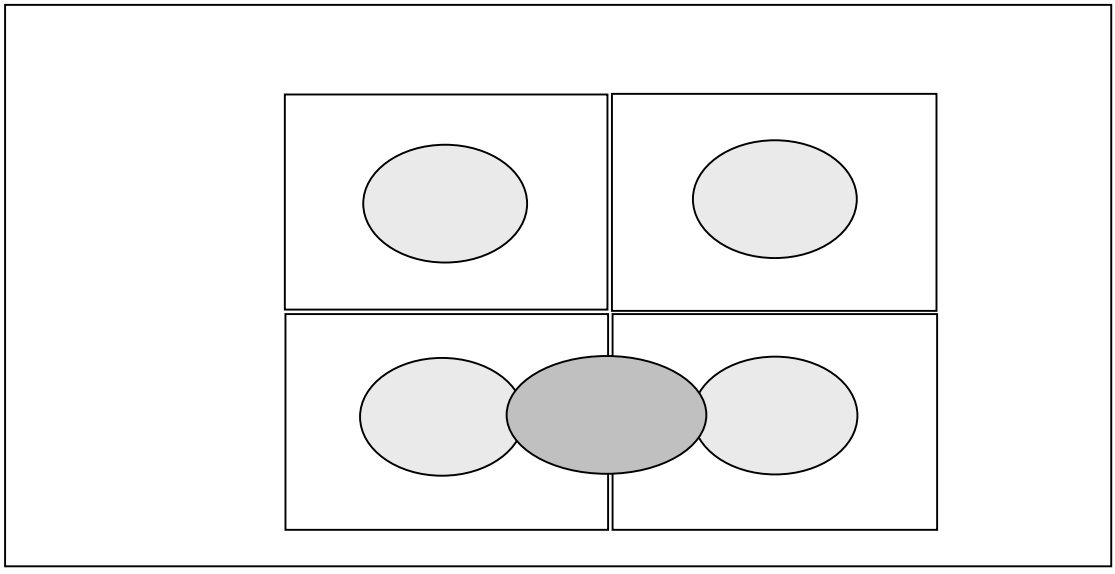
Having examined the literature foundations, the next chapter examines three pillars of literature on which the *Perceived EPQ* construct is partly based at an operational level. *Internal Service Quality, Information Systems Quality,* and *E-Service Quality* all provide useful research into service delivery and measurement, occupying different areas within the literature framework.

Chapter 3: The Pillars of Perceived EPQ

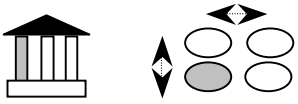


This chapter explores the three pillars of literature on which the *Perceived EPQ* construct is partly based. Much *Service Quality* literature considers service as it relates to external customers in an off-line setting. However, *Perceived EPQ* is grounded in a mixed, internal customer context. *Internal Service Quality, Information Systems Quality,* and *E-Service Quality* occupy different areas within the literature framework **(Figure 11)**. These three pillars are relevant in conceptualising the *Perceived EPQ*, because of their focus on either internal settings, on-line settings, or both. The first section examines *Internal Service Quality* literature, the second *Information Systems Quality* literature, and the third *E-Service Quality* literature. The chapter concludes by reviewing how these three areas of work help in delineating *Perceived EPQ* and present research questions.

Figure 11. Literature Framework



3.1 Internal Service Quality



This section explores how *Internal Service Quality* (*ISQ*) literature can help in delineating *Perceived EPQ*. Definitions of *ISQ* are presented, including the notion of

the *internal customer*. This is followed by alternative perspectives on measuring service quality as perceived by internal customers (users).

ISQ Background

Compared with external service research, there are relatively few academics focused on *internal* service encounters (Stanley & Wisner, 2001). This is partly a consequence of the marketing background of many service quality academics (Reynoso & Moores, 1995) and the multi-disciplinary nature of *ISQ* (Hallowell *et al.* 1996; Farner *et al.* 2001). However, there is increased recognition of the importance of delivering service quality to internal customers (Bruhn, 2003).

Gummesson (1993) presents a 'multi-perspective approach' to service delivery. He contends that the perspectives of contact staff, support staff, management, and owners need to be considered in addition to external customers, to ensure high levels of service. As such, the term 'service quality' acquires a broader meaning, encompassing both external and internal perspectives (Yavas, 1995a, 1995b). Little (2003) notes that in order to achieve business success, it is not enough to focus purely on the needs of external customers. The view supports the work of numerous authors who suggest that delivering service to employees is an important prerequisite to external service and profitability (Zeithaml, 1990; Davis, 1992; Hart, 1995; Heskett *et al.* 1997).

3.1.1 *ISQ* Defined

Internal Service Quality (*ISQ*) can be defined as the quality of service 'provided by distinctive organisational units or the people working in these departments to other units or employees within the organisation' (Stauss, 1995). Goebel *et al.* (2003) term the construct as the extent to which a department performs required tasks 'quickly, accurately, completely and with the intent of satisfying' (p5). More simply put, *ISQ* is the quality of service delivery as perceived by internal customers.

Traditionally, the term 'customer' has applied to external buyers of goods and services. However, there is now a body of literature which takes a broader view of the term, considering individuals outside and within organisations. An *internal customer* is defined as member of an organisation who receives a product or service from others

within an organisation (Nagel and Cilliers, 1990). As such, internal and external customers are similar in that they have expectations of the service they should receive and make judgements based on these expectations (Gremler *et al.* 1995; Bruhn, 2003). The internal customer concept has roots in both *TQM* and *Internal Marketing* literature.

Internal Customer in TQM Literature

The idea of internal customers is addressed by Ishikawa (1985), who writes that, 'the next in the process is your customer.' This idea has been coined by a number of academics as 'Next Operation as Customer' (Denton, 1990; Bhote, 1991; Ratcliffe-Smith and Brooks, 1993). Within the *NOAC* perspective, organisations can be viewed as a network of functional units, linked together with the aim of delivering service to external customers (Marshall *et al.* 1998). Each unit receives inputs (goods/services), transforms them, and delivers the output (goods/services) to the next operation in the chain – their internal customer. Each link in the chain has an interaction between internal service providers and internal customers (Finn *et al.* 1996). The *NOAC* viewpoint treats internal service as a two-way exchange between individuals in different departments, in which the service provider has the responsibility to meet the needs of his/her internal customer (Marshall *et al.* 1998).

Internal Customer in Internal Marketing Literature

The concept of an internal customer is also applied in terms of 'selling' jobs to service sector employees (Sasser & Arbeit, 1976). This idea evolved into what is now referred to as *Internal Marketing* (Berry, 1981; Gummesson, 1987, 1990; Davis, 1991). Berry (1981) posits that all employees are internal customers and jobs are 'internal products'. Organisations need to 'sell' these products in a way that meets internal customer expectations.

A number of academics suggest that organisations should treat internal customers in much the same way as they would their external customers (cf. Schneider & Bowen, 1993; Azzolini & Shilliber, 1993; Foreman & Money, 1995; Piercy, 1995; Bowen & Johnston, 1999). Individuals and departments should view themselves as both suppliers and customers within organisations (Farner *et al.* 2001; Stauss, 1995). Rust *et al.* (1996) refer to this change of emphasis as moving from 'employee as servant' to

'employee as customer'. Thus the emphasis of *Internal Marketing* has broadened from 'selling jobs' (Berry, 1981) to attracting, developing, motivating, and retaining qualified employees (Reynoso & Moores, 1995).

Bekkers and Van Haastrecht (1993) argue that internal marketing is about creating intra-organisational market conditions which ensure that the needs of internal customers are met. As *Internal Marketing* research has expanded, there is an increasing tendency to view employees as internal customers (Berry & Parasuraman, 1991). Fisk *et al.* (1993) argue the *Internal Marketing* is defined by two key maxims – every member of an organisation has a customer; internal customers must be satisfied with the service they receive before they are willing or able to deliver service to external customers. Just as external marketing focuses on identifying and meeting external customer requirements, so *Internal Marketing* is concerned with identifying and meeting the expectations of internal customers (Varey, 1995; Kang *et al.* 2002).

The Internal Customer in an ISQ Context

The internal customer concepts found in *TQM* and *Internal Marketing* literature are similar in the underlying principal that employees are internal customers and that failure to delivery high levels of service to them will impact on the ultimate service provided to external customers (George, 1990; Brooks *et al.* 1999; Kang *et al.* 2002). However, there are slight differences between the two perspectives in the way they see the service provider. *Internal Marketing* literature is largely focused on how the company serves its internal customers (Marshall *et al.* 1998). In contrast, the *NOAC* perspective usually views the service provider as an organisational unit or even an individual (Heskett *et al.* 1994). *ISQ* is more often concerned with service provided by 'distinctive organisational units or the people working in these departments' (Stauss, 1995). Therefore, the concept is most closely linked to the *NOAC* perspective found within *TQM* literature.

3.1.2 Differences between External & Internal Customers

Reynoso and Moores (1995) note that some academics view measuring *ISQ* 'as conceptually no more complex than adopting or adapting the existing findings from [external] customer-based research.' Whilst this proposition has obvious appeal, there

are concerns over the transferability of external service quality measures to internal settings. A key concern is that important differences exist between internal and external customers (Marshall *et al.* 1998) and therefore service quality factors will differ between settings (Brooks *et al.* 1999). These differences concern *choice* and *buyer type* (Stauss, 1996; Bruhn, 2003).

Choice

External customers typically have a choice over where to take their business (Finn *et al.* 1996) and have the option of exiting unsatisfactory relationships. Such free market forces, encourage organisations to provide excellent service quality or risk losing customers. However, internal suppliers rarely face such market conditions (Farner *et al.* 2001). Historically, internal suppliers have had a monopolistic position and the use of their service has been mandatory (Stauss, 1995). Internal customers are often given little or no choice over their service provider regardless of quality or cost (Davis, 1993; Gremler *et al.* 1994; Auty & Long, 1999; Paraskevas, 2001).

As a result, many internal suppliers have limited incentive to improve internal service. Albrecht and Bradford (1990) note the 'take it or leave it' attitude that can develop when internal customer choice is restricted. He argues that whilst repeat custom is a sign of good service in external settings, internal customers may keep coming back simply because they have no choice. Nagel and Cilliers (1990) agree, stating that internal customers are often 'captive' to internal suppliers.

Auty and Long (1999) suggest that some internal customers may be unwilling to voice discontent with internal suppliers for fear of receiving even worse service from them in the future. Unlike external customers, they may not have the option of switching supplier. Paraskevas (2001) argues that social and psychological intra-organisational conditions often limit internal customers' ability to freely complain. He suggests that continuous and anonymous feedback can help solve this problem. A number of authors have suggested that encouraging feedback helps employees to see themselves as internal customers (cf. Fierens, 1997).

Stauss (1995) argues that in order to create an internal customer orientation, individuals should be given more freedom to choose their supplier. In a number of

organisations, there has been a steady erosion of internal suppliers' inalienable 'right' to deliver service to internal customers. Gremler *et al.* (1994) comment that internal service departments are increasingly accountable for the quality of service delivered to internal customers. Farner *et al.* (2001) argue that the rise of outsourcing gives some internal customers the option of exiting unsatisfactory relationships with internal suppliers.

Buyer Type

SERVQUAL is largely based on experience properties of service quality. Parasuraman *et al.* (1985) justify this position by stating that services have few search properties and it is often difficult to assess credence properties. However, Marshall *et al.* (1998) state that because internal customers are 'professional' consumers of internal services, they are far more knowledgeable than most external customers with regard to the service provided. As such, they may be in a stronger position to assess competence of service providers (credence properties). Internal customers are closer in their expertise to customers in business markets. This view is borne out by a number of internal *SERVQUAL* applications that have omitted the *tangibles* dimension when measuring *ISQ*. Unlike external customers, who may be impressed with cosmetic features, internal customers may see these same elements as excessive and wasteful (Young & Varble, 1997; Paraskevas, 2001). Furthermore, there is often little face-to-face interaction between internal customers and internal suppliers (Young & Varble, 1997). As a result tangible elements such as physical layout, equipment and clothing, may be of little concern when making service quality assessments of internal suppliers.

3.1.3 *ISQ* Research

There is a small, but growing body of work examining different aspects of internal service including internal service encounters, internal service classification, and internal service delivery (Bruhn, 2003). However, the current research is predominantly descriptive and has failed to keep pace with external service research (Frost and Kumar, 2000). Despite growing interest in the area, relatively few academics or practitioners have attempted to empirically measure *ISQ* (Stanley &

Wisner, 2001). Reynoso and Moores (1995) argue that it is not enough to be aware of the existence of internal customers. They propose a set of sequential stages in implementing an internal customer initiative.

1. Create internal awareness
2. Identify internal customers and suppliers
3. Identify expectations of internal customers
4. Discuss these expectations with internal suppliers
5. Make changes in order to deliver the level of service required
6. Measure *ISQ* and give feedback to internal suppliers

Measurement is an essential part of this process. Organisations need to understand internal customer expectations and measure the extent to which these needs are being met by internal service providers (Koska, 1992; Berry *et al.* 1994; Reynoso & Moores, 1995; Frost & Kumar, 2000). McDermott & Emerson (1991) state that, 'the best way to find out your internal customers' specific expectations is to ask them directly what they think about your service.' As such, internal assessment of *ISQ* can help to identify problem areas and provide a basis for continual improvement (Young & Varble, 1997; Weir, 1998). Gremler *et al.* (1994) note that increased accountability makes the measurement of *ISQ* all the more important. They state that, 'internal service departments need to apply measures of service quality to the internal service encounter, to ensure that internal providers of services are providing satisfactory service to their internal customers.'

In researching various *ISQ* activities, Wisner and Stanley (1999) note that many organisations use meetings between departments to resolve conflicts. However, less time is spent measuring *ISQ* through the use of surveys or a formal complaint process. Boraday-Preston and Haywood (1998) and Rampersad (2001) argue that customer surveys are a powerful way to measure internal customer perceptions of service. Bruhn (2003) supports this idea, stating that employee surveys can act as a useful 'barometer' of organisational performance in relation to their internal customers.

Reynoso & Moores (1995) argue that it is possible to capture the characteristics of *ISQ* as a set of dimensions in the same way as in an external customer setting.

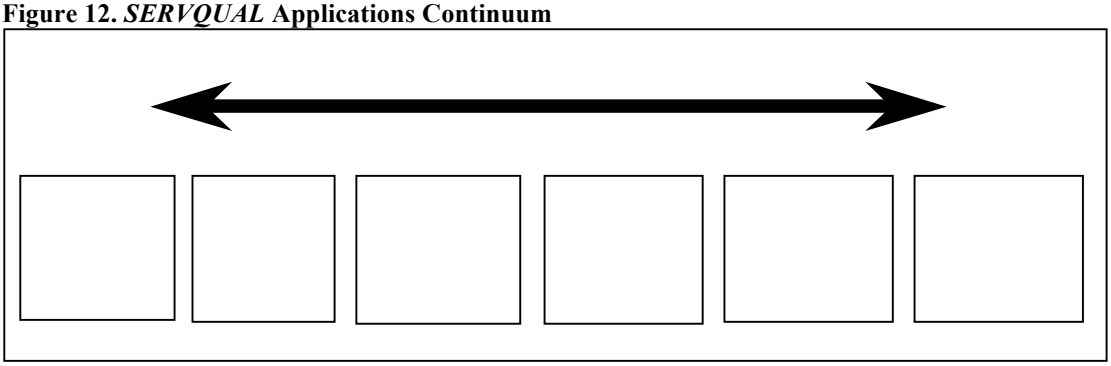
However, as one might expect, there is no real consensus as to what these dimensions are (Finn *et al.* 1996; Kang *et al.* 2002). Two popular approaches to measuring *ISQ* are found in the literature. Firstly, the application *SERVQUAL* and secondly, the development of *ISQ*-specific measurement scales. These two approaches are discussed in turn.

3.1.4 Measuring *ISQ* with *SERVQUAL*

Zeithaml *et al.* (1990) state that, with appropriate adaptation, *SERVQUAL* can be used by service units within organisations. Kang *et al.* (2002) argue that, as disconfirmation theory is equally appropriate for measuring both external and internal service quality, it is reasonable to assume that *SERVQUAL* can be used to measure *ISQ.* Another justification for applying externally-developed service quality measures to internal settings is that the relationship between external customer and an organisation is just one link in network of interactions, many of which occur within an organisation (Heskett *et al.* 1997; Auty & Long, 1999).

Based on these propositions, some academics have sought to measure *ISQ* through application of the *SERVQUAL.* Some studies apply the scale with very limited modification whilst others make more substantial changes, including the deletion or addition of entire dimensions. Applications of *SERVQUAL* to an internal setting can be seen to exist along a continuum of modification **(Figure 12)**. These studies are now discussed based on their position along this continuum.

Figure 12. *SERVQUAL* Applications Continuum



Chaston (1994, 1995) applies the *SERVQUAL* scale in a study of three U.K. clearing banks. Modifications to item wording are more reflective of the industry setting than the internal nature of the research. The only other change is to reject the use of 7-point

Likert scales suggested by Zeithaml *et al.* (1990) in favour of 5-point scales. The author states internal customer requirements are seen as less important than efficiency and argues that internal customer orientation requires greater emphasis on service delivery. He concludes that the modified *SERVQUAL* tool is appropriate for measuring internal service quality.

The use of *SERVQUAL* in an internal context is tested by Young and Varble (1997), measuring internal customer perceptions of the purchasing department in an American university. Minor modifications are made to *SERVQUAL* items to suit the research setting, but otherwise the scale remains unchanged. The research reveals that *reliability* is the most important dimension, followed by *responsiveness, assurance,* and *empathy*. In line with a number of other studies (cf. Brooks *et al.* 1999; Kuei, 1999), the authors find that the *tangibles* dimension is extremely unimportant in an internal setting. Young and Varble (1997) conclude that the *SERVQUAL* scale is applicable to an internal context and is useful for measuring service quality as perceived by internal customers of purchasing departments.

Kang *et al.* (2002) empirically test the transferability of *SERVQUAL* in a South Korean university. Their research applies a *SERVQUAL* scale with items re-worded to reflect internal service. Confirmatory factor analysis supports the existence of the five *SERVQUAL* dimensions to an internal setting. Additionally, structural equation modelling shows that only *reliability* and *responsiveness* are significant in predicting overall perceptions of *ISQ.* The authors argue that their scale is an example of how to appropriately modify *SERVQUAL* items for *ISQ* research.

In a study of Singapore Airlines, Frost and Kumar (2000, 2001) apply a modified *SERVQUAL* scale – *INTSERVQUAL* - to front-line staff in order to evaluate the service provided by support staff. Their results support the scale in an internal setting. The authors show that internal customer perceptions of each dimension play a significant role in overall *ISQ* ratings. *Responsiveness* has the most influence on *ISQ* perceptions, which contrasts with the findings of Parasuraman *et al.* (1988, 1991a), who state that *reliability* is the most important service quality factor. Frost and Kumar, suggest that further research is required to examine if this difference is typical to other internal settings.

Boshoff and Mels (1995) examine the relationship between organisational commitment and *ISQ* in an insurance company. In measuring perceptions of *ISQ*, the authors apply a truncated version of *SERVQUAL*, with two items from the *reliability, responsiveness, assurance* and *empathy* dimensions and just one item for *tangibles.* They identify a positive relationship ($p < 0.01$) between organisational commitment and *ISQ*, concluding that their findings support the ideas developed in the *Internal Marketing* literature. Hill and McCrory (1997) explore the conceptualisation and measurement of *ISQ* in a UK maternity hospital. Guided by the work of Parasuraman *et al.* (1988), five dimensions broadly relating to *SERVQUAL* are identified.

Tangibles ➔ *Hygiene / Cleanliness / Certain facilities*
Empathy ➔ *Communications and interactions between staff and patients*
Assurance ➔ *Professional competence / Security / Safety of mother and baby*
Responsiveness ➔ *Pain relief issues*
Reliability ➔ *Continuity of service*

Kuei (1999) empirically tests the relationship between *ISQ* and the *'climate of an organisation'* in a study of a purchasing department's internal customers. The *ISQ* element of the proposed model is measured using the *SERVQUAL* scale minus the *tangibles* dimension. It is argued that because internal customers have no choice over their service provider, the search aspect of quality encapsulated by the *tangibles* dimension is of little concern. Factor analysis provides evidence of reliability and validity of the four dimensions of *'Intangible ISQ'*, leading to the conclusion that *SERVQUAL*, minus the *tangibles* dimension, is an appropriate *ISQ* measure.

In a study of *ISQ* in the gaming industry, White and Rudall (1999) propose a measurement scale that includes the original five *SERVQUAL* dimensions and three additional dimensions – *communication, flexibility,* and *relevance.* Whilst, their proposed *INTSERVQUAL* scale was found to be a robust measure of internal service, the original *SERVQUAL* instrument had even higher reliability and validity. As a result, the authors conclude that *SERVQUAL* is appropriate for measuring *ISQ* in the hospitality industry.

Research by Lings, Brooks and Botschen (1998, 1999, 2000) suggests that internal customers may use different criteria to external customers when evaluating the service they receive from internal suppliers. In exploratory research, Lings and Brooks (1998) propose ten dimensions of *ISQ*, using eight from Parasuraman *et al's* original 1985 work and suggesting two additional *ISQ*-specific dimensions – *proactive decision making* and *attention to detail. Proactive decision making* is concerned with how internal suppliers are managed in order to meet internal customer expectations. *Attention to detail* relates to the ability of internal suppliers to provide detailed and accurate information. This dimension transcends the external *competence* dimension in that the concern is not only with having the knowledge, but also possessing effective reporting procedures to disperse that knowledge effectively. Replication work by Brooks *et al.* (1999) and Lings (2000) identify similar dimensions, but propose another *ISQ*-specific dimension of *leadership,* considering the level of direction provided by managers to their employees. Lings (2000) concludes that *SERVQUAL* is only appropriate for measuring *ISQ* after substantial modification.

Based on a survey of UK service firms, Caruana and Pitt (1997) propose the *INTQUAL* measurement scale comprising of 17 items and two dimensions, *service reliability* and *management of expectations.* Items for their scale come from *SERVQUAL* and additional focus groups involving service firm managers. They conclude that the scale is reliable, but further work is required to assess aspects of convergent, discriminant and predictive validity.

Reynoso and Moores (1995) question Zeithaml *et al's* (1990) proposition that *SERVQUAL* can be applied by departments within organisations. A provisional set of *ISQ* dimensions is identified through exploratory research based on semi-structured interviews and content analysis. Subsequent questionnaire testing reveals an *ISQ* construct made up of ten distinct dimensions – *helpfulness, promptness, communication, tangibles, professionalism, reliability, confidentiality, flexibility, preparedness,* and *consideration.* The authors argue that whilst these dimensions bear similarities to the ten original dimensions identified by Parasuraman *et al.* (1985), differences justify the view that *ISQ* and external service quality are different. They conclude that researchers should be looking for a small set of generic dimensions, whilst accepting that other dimensions are more specific to a particular setting.

The research of Stanley and Wisner (Stanley & Wisner, 1998, 2001, 2002; Wisner & Stanley, 1999) examines the relationship between internal and external service. The authors argue that the performance of the purchasing function ultimately impacts on external customer satisfaction. Measurement of the internal service element of their work is based in part on the ten original service quality dimensions identified by Parasuraman *et al.* (1985). The nine factors in their most recent work are *quality of products / services, responsiveness to internal customers' needs, flexibility to changing internal customer needs, on-time delivery of products, ability to meet internal customer expectations, on-time delivery of information, reliable delivery of information, explanation of problems, and communication level.* It should be noted that their work does not directly measure internal customer perspectives, only the viewpoint of purchasing managers. As such, it is hard to know how accurately their findings reflect real perceptions of *ISQ*. The authors call for further research to examine internal service from the perspective of internal customers.

Auty & Long (1999) report on the findings from a set of MBA studies into *ISQ* in 'a complex, globally-oriented service industry with 70,000 employees'. These studies apply either qualitative or quantitative methods derived from Parasuraman *et al.* (1985, 1988). The quantitative studies of *ISQ* are based on the revised *SERVQUAL* instrument (Parasuraman *et al.* 1994a, 1994b) though re-wording of items to suit an internal setting is common. Sample size varies from 12 to 124, depending on the nature of each study. The authors suggest that Parasuraman *et al's* (1985) ten original service quality dimensions are more applicable to internal settings than the five collapsed ones in the *SERVQUAL* scale, because *courtesy* and *understanding* remain separate from *accessibility*. Additionally, they argue that the definitions of service quality dimensions may differ between settings. For example, they report that the *tangibles* dimension often does not relate to the interior decoration, tidiness etc, but rather to the 'product' element of a service provided, as in the case of hardware associated with the service of an IT department. Auty and Long conclude that *SERVQUAL* provides a good starting point for *ISQ* research, but its external origins should be borne in mind.

Thoughts on applying SERVQUAL to ISQ

A number of authors have applied *SERVQUAL* as a basis for measuring *ISQ* **(Table 3)**. There is a wide variety in how the tool has been used. These include almost exact replication (cf. Chaston, 1994; Young & Varble, 1997; Kang *et al.* 2002), minor changes (cf. Frost & Kumar, 2000; Boshoff & Mels, 1995; Hill & McCrory, 1997), addition and deletion of dimensions (cf. White & Rudall, 1999; Kuei, 1999), and major departures from the scale (cf. Brooks *et al.* 1999; Reynoso & Moores, 1995). These studies have failed to reach consensus on the applicability of *SERVQUAL* to an internal setting.

Table 3. *SERVQIAL* Applications in *ISQ* Literature

Study	Instrument	Analysis	Factor Structure
Chaston '94, '95	36 items based on *SERVQUAL*	Descriptive analysis of survey data	5 factors, plus *Proactive Decision-Making*
Boshoff & Mels '95	9 items from *SERVQUAL*	Path Analysis	1 factor: ISQ is uni-dimensional
Reynoso & Moores '95	45 items from *SERVQUAL* + qualitative work	*PCA* by oblique rotation	10 factors, similar to PZB '85
Caruana & Pitt '97	34 items from *SERVQUAL* + focus groups	*PCA* by varimax rotation	2 factors comprised of 17 items
Hill & McCrory '97	24 items 'guided' by *SERVQUAL*	Descriptive analysis of survey data	5 factors, new names
Young & Varble '97	22 original items	Descriptive analysis of survey data	4 factors: *Tangibles* unimportant
Lings, Brooks, Botschen '98, '99, '00	10 PZB ('85) factors	Descriptive analysis of case data	8 of 10 PZB factors, plus 3 new factors
Stanley & Wisner '98, '01, '02	12 items based on *SERVQUAL*	Descriptive analysis of survey data	9 factors in '02 study
Auty & Long '99	22 original items	Mix in range of MBA studies	10 PZB ('85) factors more applicable to ISQ
Kuei '99	18 items (no *Tangibles*)	Cluster analysis	4 factors: *Tangibles* unimportant
White & Ruddall '99	21 items + 6 ISQ-specific	*PCA*	5 factors, but items do not load as hypothesised
Frost & Kumar '00, '01	22 items + 2	*PAF* by oblique rotation	5 factors
Kang *et al.* '02	22 original items	*CFA*	5-factor model

PAF – Principal Axis Factor Analysis
PCA – Principal Components Factor Analysis
CFA – Confirmatory Factor Analysis

Support for *SERVQUAL* comes from a number of studies, which report its broad applicability for *ISQ* measurement (cf. Chaston, 1994; Young & Varble, 1997; Kang *et al.* 2002; Frost & Kumar, 2000). However, there are also a number of concerns raised. Firstly, content validity is questioned by the need for additional items and

dimensions not incorporated in the *SERVQUAL* scale. These include *preparedness, confidentiality* (Reynoso & Moores, 1995), *training* (Fierens, 1997)*, proactive decision making, attention to detail,* and *leadership* (Lings & Brooks, 1998)*,* and *communication, flexibility,* and *relevance* (White & Rudall, 1999). Construct validity is questioned by the number of *SERVQUAL* applications that reject or modify the *tangibles* dimension for *ISQ* measurement (Young & Varble, 1997; Lings & Brooks, 1998; Brooks *et al.* 1999; Auty & Long, 1999; Kuei, 1999). Finally, some authors (cf. Auty & Long, 1999) suggest that the ten original service dimensions found in earlier work (Parasuramn *et al.* 1985) are more applicable to internal settings than the five found in *SERVQUAL*.

Whilst some minor changes are necessary for each research setting (Zeithaml *et al.* 1990), major alterations bring into question the reliability and validity of what remains. Auty and Long (1999) and Kang *et al.* (2002) criticise the fact that most *SERVQUAL* applications to *ISQ* measurement fail to thoroughly test the scale's applicability. In noting the similarities between the 1985 research and their own *ISQ* scale, Reynoso and Moores (1995) argue that researchers should be looking for a small set of generic dimensions, whilst accepting context-specific factors are necessary. They conclude that caution is required when considering *SERVQUAL* for *ISQ* measurement, especially given the questions over the scale's applicability to different external settings.

3.1.5 *ISQ*-specific Measurement Scales

In addition to the wide-ranging debate over the efficacy of *SERVQUAL* to external service encounters, there are additional concerns over the transferability of the scale to internal settings. This has led to the development of some *ISQ*-specific measurement scales. Of particular interest to this study are scales developed in a procurement setting (cf. Cavinato, 1987; Hendrick & Ruch, 1988; Rossler & Hirsz, 1996; Finn *et al.* 1996; Fredendall *et al.* 2005).

Procurement ISQ Measures

Cavinato (1987) argues that 'hard numbers' are not appropriate in measuring the views of the procurement function from the perspective of non-procurement

personnel. Instead he proposes a 'broad umbrella of evaluative factors' (p10). Based on a literature review, personal interviews, and a survey of both purchasing and non-purchasing managers in over fifty firms, Cavinato posits a set of five factors for measuring the service delivered by a purchasing function – *output of purchasing, interactions with purchasing, observations of purchasing, reputation of purchasing,* and *expectations of purchasing.*

Output of purchasing is concerned with the experiences of internal customers in their interactions with the procurement function. The factor includes customer service, speed, reliability, price/quality, convenience, advance information, assistance, operating relations, and provision of information. *Interactions with purchasing* relates to role conflicts, personalities and impressions. *Observations of purchasing* focus on the auditors' findings and the perceived ethics of the operation. Word-of-mouth communication from both objective and subjective impressions formed through interaction and output combine to form *reputation of purchasing.* Lastly, *expectations of purchasing* relates to the perceived contribution the function makes to the organisation as a whole and the development of purchasing skills.

In research undertaken in a Fortune 500 electronics firm, Hendrick and Ruch (1988) examine the performance appraisal criteria used by internal customers of the procurement department. A set of criteria are developed through exploratory work with suppliers, internal customers, procurement managers, and buyers. The authors argue that there are ten important factors used when assessing the performance of procurement personnel.

1. *Making purchases that arrive on time*
2. *Making purchases that pass incoming quality assessment inspecting*
3. *Meeting target costs*
4. *Knowledge of commodities in the buyer's area of responsibility*
5. *Ability to control purchase order cycle time*
6. *Ability to cultivate qualified suppliers*
7. *Ability to perform work with the minimum of errors*
8. *Ability to determine the bottom price a supplier will take*
9. *Amount of complexity of commodity in buyer's responsibility*
10. *Providing timely responses to inquiries from suppliers and internal customers*

Subsequent quantitative research is employed to develop and validate a measurement tool for buyer performance. Rossler & Hirsz (1996) build on this work in a U.S. oil company. A survey of forty engineering and maintenance managers in two divisions considers seven areas of customer-oriented purchasing performance – *service, accuracy, communication, responsiveness, professionalism, technical knowledge,* and *customer concerns.* Data analysis indicates that closer interaction with internal customers can significantly improve perceptions of the purchasing department's *professionalism* and *responsiveness.* However, the authors conclude that *technical knowledge* may play a more critical role in driving internal customer perceptions. They note that many non-procurement managers continue to see purchasing as a clerical function and therefore deal directly with suppliers. Finally, Rossler and Hirsz suggest that the purchasing function still does not understand internal customer expectations and this leads to overall dissatisfaction within the organisation.

The research of Finn, Baker, Marshall and Anderson (Finn *et al.* 1996; Marshall *et al.* 1998) is arguably one of the most useful in terms of *ISQ* measurement in a procurement context. In recognising the debate surrounding *SERVQUAL*, Finn *et al.* (1996) seek to develop an *ISQ* tool from scratch through literature review, individual interviews, focus groups and survey work in a major U.S. manufacturing company. In this research the internal service provider is the purchasing department and the internal customers are the host of other units in the organisation. Their initial work seeks answers to two key questions - *What do internal users want from the purchasing department? Do they think they're getting it?*

Factor analysis of thirty-eight *ISQ* items reveals nineteen combining to form six factors – *TLC, delivering value, order processing, vendor management, no surprises* and *knowledge.* Their second article (Marshall *et al.* 1998) examines the dimensionality of *ISQ* through a replication study. Factor analysis and a clustering exercise reveals seven factors rather than six, with *knowledge* split into *problem solving* and *conscientiousness. TLC (Tender loving care)* is concerned with how internal customers are treated. It includes being treated as important and valuable, and in a friendly and courteous manner. *Delivering value* relates to getting the best prices within appropriate constraints, and includes involving internal customer in evaluation, checking delivery schedules and meeting quality requirements at the best price. *Order*

processing relates to getting orders processed quickly and efficiently. *Vendor management* relates to checking with internal customer before switching supplier and being willing to consider alternative suppliers. *No surprises* is closely linked to vendor management in that is concerns keeping users informed about important issues related to procurement. *Problem solving* focuses on the knowledge of internal service providers. Finally, the importance of keeping promises and responding quickly to queries is incorporated in *conscientiousness.*

Finally, Fredendall *et al.* (2005) explore how the internal service performance of purchasing is influenced by cooperation. Using data collected from purchasing managers, they test a theoretical model which combines external and internal cooperation to explain internal service performance. This model recognises the importance of *visionary leadership* in driving cooperation, as well as the impact of *commitment, trust, communication,* and *shared goals* on external cooperation. Of particular relevance here is the researchers' examination of internal cooperation, which is defined as the 'propensity of the organisation to engage in non-competitive activities internally among employees' (p28). Internal cooperation contributes to the reputation of the purchasing department and aids internal service provision. Measurement of internal service performance is based on items from Goebel *et al.* (2003):

1. *I place priority on requests for assistance from internal customers*
2. *I attach a high level of importance to requests from internal customers*
3. *Solving my internal customer's problems is part of my job*
4. *Internal customer requests are handled immediately*

Data analysis of two survey samples of purchasing managers in the manufacturing sector indicates strong support for the contention that both internal and external cooperation influence overall internal service performance.

Other ISQ Measures

In addition to *ISQ*-specific measures in a procurement setting, there are a number of other useful scales within a broader *ISQ* context. McDermott & Emerson's (1991) is one of the earlier works to articulate a set of generic factors used by internal customers when assessing service quality. These are *comparative value, adequate*

resources, responsiveness, reliability, flexibility, recovery to problems, clear adequate communication, empathy and understanding, accountability, and *interpersonal skills*. They state that in order to understand internal customers' expectations, one must measure perceptions of *ISQ* through focus groups or satisfaction surveys.

Lewis and Gabrielsen (1995) argue that the *SERVQUAL* scale is flawed in measuring *ISQ*. Their research in the Norwegian banking market (1995, 1998) explores service quality management within organisations. A survey (1998) based on literature work and data collected during in-depth interviews, observation and company documentation (1995) is applied to front-line bank employees. They identify eight areas of *ISQ - Organisational culture and working environment, individual attitudes, role of management, role perception and training, infrastructure and organisational systems, evaluation and rewards, service recovery,* and *improvements.* Their view of *ISQ* is described as functional rather than technical, being particularly concerned with people and culture-related variables. The authors conclude that of particular importance is the role of management in providing proactive and visible leadership within an organisation.

Lewisohn and Reynoso (1995) provide an illustration of implementing an internal customer concept in an *NHS* Trust in the U.K. Their 'internal customer supply chain audit' measures *ISQ* in relation to five criteria – *timeliness, accessibility, co-operation, reliability,* and *interpersonal contact.* These criteria were determined in consultation with managers within the organisation. The authors argue that the 'quality management approach' has brought a number of benefits in terms of better understanding of internal customer needs, improved staff motivation, and increased inter-departmental cooperation. Finally, they state that improvements to *ISQ* will feed through to external service delivery.

Based on a literature review of key authors (cf. Heskett *et al*. 1990; Zeithaml, 1990; Hart, 1992) and a study of three U.S. insurance companies, Hallowell *et al.* (1996) identify eight dimensions of *ISQ* which they believe are important to most organisations: *Tools, policies & procedures, teamwork, management support, goal alignment, effective training, communication,* and *rewards & recognition.* Results

from multiple regressions show that *ISQ* is more important in predicting employee job satisfaction than wages or benefits.

Gilbert (2000) researches the difference between *ISQ* perceptions of internal customers and internal service providers. Factor analysis of 15 statements relating to *ISQ* reveals two factors – *technical competence* and *personal service* – made up from 12 items. The two factors are strongly correlated to *'overall internal customer satisfaction with service received'* (R^2 = 0.85 and 0.71 respectively). Gilbert also reports significant differences between the self-reported ratings of focal groups and ratings of their internal customers. He argues that self-rating bias and perceptual distortion brings into question the validity of assessing *ISQ* purely on perceptions of the service provider. He concludes that it is more appropriate to measure *ISQ* based on internal customer ratings.

Bruhn (2003) presents an *'Internal Service Barometer'* in his *ISQ* research. Rather than base the tool on established scales, he conceptualises *ISQ* into 12 dimensions – *competence, reliability, accessibility, friendliness, reaction speed, time to provide the service, flexibility, customization, added value generated, cost-benefit ratio, transparency in services offered,* and *cost transparency.* Bruhn argues that *ISQ* is transaction-specific satisfaction which determines both comprehensive internal customer satisfaction as well as internal customer retention. Empirical data shows that *ISQ* exerts a strong positive influence on internal customer satisfaction and, to a lesser extent, on internal customer retention. This transaction-specific view of *ISQ* is unusual and appears more in keeping with the construct of satisfaction (Johnston, 1995a, 1995b, Caruana & Pitt, 1997). For most academics, *ISQ* is defined as more global in nature, being determined by numerous transaction-specific encounters.

3.1.6 Conclusion on *ISQ* Measurement

ISQ is defined as the quality of service delivery as perceived by internal customers. As such, research in this area is extremely valuable in modelling *Perceived EPQ.* The literature emphasises the importance measuring internal customer perceptions, as part of *ISQ* improvement efforts (cf. Reynoso & Moores, 1995; Gilbert, 2000; Rampersad,

2001). **Table 4** provides an overview of the variables identified in the *ISQ* literature that may be useful in modelling *Perceived EPQ*. It is worth noting that, in the interests of clarity, this list represents the 'key' articles rather than an exhaustive list of every publication read. Additionally, where authors have published multiple papers with similar scales, only one column is assigned.

Whilst some authors have sought to apply *SERVQUAL* to an internal setting, there are concerns over its use. Content validity is questioned by the need for additional dimensions not incorporated in the *SERVQUAL* scale (cf. Reynoso & Moores, 1995; Fierens, 1997; Lings & Brooks, 1998; White & Rudall, 1999) whilst the broad rejection of the *tangibles* dimension for *ISQ* measurement raises questions over construct validity (cf. Young & Varble, 1997; Lings & Brooks, 1998; Brooks *et al.* 1999; Auty & Long, 1999; Kuei, 1999). Therefore, it may be more appropriate to develop measurement tools specifically designed for use within organisations.

ISQ-specific measurement scales developed in a procurement setting provide a particularly rich vain of work, as they incorporate many purchase elements relevant to *Perceived EPQ*. However, their limitation is that none are based on an e-procurement setting and therefore only give a partial view of the construct. Finally, other *ISQ* measures provide interesting insights for this study, particularly in terms of support (*training, communication, availability, reliability, responsiveness, flexibility, service recovery, empathy,* and *friendliness*). In conclusion, *ISQ* research helps in generating items relating to support and fulfilment, but other literature is required to support the *Perceived EPQ* construct. The next section examines *Information Systems Quality* literature, as it relates to the study.

Table 4. Relevant Variables from *ISQ* Literature

VARIABLE NAME	Cavinato '87	Hendrick & Ruch '88	McDermott & Emerson '91	Chaston '94, '95	Boshoff & Mels '95	Lewis & Gabrielson '95, '98	Lewisohn & Reynoso '95	Reynoso & Moores '95, '97	Finn *et al.* '96	Hallowell *et al.* '96	Rossler & Hirsz '96	Caruana & Pitt '97	Fierens '97	Hill & McCrory '97	Young & Varble '97	Lings & Brooks '98	Stanley & Wisner '98, '01, '02	Auty & Long '99	Kuei '99	White & Ruddell '99	Frost & Kumar '00, '01	Gilbert '00	Kang *et al.* '02	Bruhn '03	Croom & Johnston '03	Fredendall *et al.* '05
Responsiveness / Promptness	x	x	x	x	x			x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
Concern / Empathy			x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Knowledge / Competence / Skills	x	x			x		x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x
Support Availability / Resources	x		x	x		x	x	x	x	x		x			x	x		x	x	x	x	x	x	x	x	
Service Reliability / Dependability	x		x	x	x		x	x	x			x			x	x	x	x	x	x	x	x	x	x	x	
Flexibility of Support	x		x		x	x	x	x	x		x	x		x	x		x	x	x	x	x		x	x	x	
Information Provision / Communication	x	x	x		x	x		x	x	x	x	x	x	x		x	x			x			x		x	x
Dealing with Problems	x		x	x	x	x		x	x	x		x			x			x	x	x	x		x		x	x
Friendliness				x	x			x	x			x	x		x	x		x	x	x	x	x	x	x	x	
Helpfulness / Assistance	x			x		x									x	x		x	x	x			x		x	
Confidentiality / Integrity								x				x		x	x			x	x	x	x		x		x	
Politeness / Courtesy				x					x						x			x	x	x	x		x		x	
Trust				x											x			x	x	x	x		x			x
Well-dressed Employees				x	x										x			x	x	x	x		x			
Accessibility / Availability							x									x		x	x	x	x			x	x	
Up-to-date Equipment				x											x			x	x	x	x		x			
Individual Attention				x											x			x	x	x	x		x			
Visually Appealing Materials				x											x			x	x	x	x		x			
Encouraging Feedback						x		x			x		x			x						x				
Accurate Information	x			x				x										x					x			x
Lead-time / Cycle-time	x	x							x		x														x	
On-time Delivery / Reliability	x	x									x						x									x
Accuracy of Service/Order	x	x							x		x															x
Product/Service Quality	x	x							x								x									
Training						x				x			x												x	
Managing Suppliers		x							x		x															
Functionality / Hardware Quality / Infrastructure						x												x							x	
Leadership						x										x										x
Speed of Processing	x	x							x																	
Interpersonal Skills			x																				x			
Reputation of Purchasing	x																									x
Accountability			x																					x		
Rewards										x														x		
On-time Information																	x									
System Integration																									x	
Customisation																								x		
System Reliability																									x	
System Security																									x	
Ease of Use																									x	
Interactions with Purchasing	x																									
Shared Goals / Cooperation																										x
Culture						x																				
Individual Attitudes						x																				
Understanding Needs				x																						
Attention to detail																x										
Proactive Decision Making																x										
Dealing with Complexity		x																								
System Capacity																									x	

3.2 Information Systems Quality 

The second pillar on which the *Perceived EPQ* construct is based on is *Information Systems Quality* literature. This section begins by briefly examining how information systems quality has traditionally been measured. It then discusses the growing appreciation of the service component within system delivery and the application of *SERVQUAL* to the literature. Problems with these applications are examined and conclusions drawn.

3.2.1 Traditional Measurement of *Information Systems Quality*

The role of the information systems function has traditionally been to design, construct, and implement systems for the benefit of the organisation (Jiang *et al.* 2002). The predominant focus of early measurement is the quality of product attributes, including timeliness, accuracy, and format (Gallagher, 1974; Jenkins & Ricketts, 1979; Larcher & Lessig, 1980). User perceptions of these attributes are viewed as one of the most important measures of information systems success (Ives & Olsen, 1984; Malone, 1990; DeLone & McLean, 1992; Doll *et al.* 1994).

The majority of early research treats information systems quality as a single first-order construct and is concerned with identifying individual components (Ives *et al.* 1983; Larcher & Lessig, 1980; Swanson, 1982). However, later work tends to view information systems quality as a second-order construct made up of a number of first-order dimensions. Three measures are particularly popular:

- *EUCS* ➔ End-User Computing Satisfaction (Doll & Torkzadeh, 1988)
- *UIS* ➔ User Information Satisfaction (Baroudi & Orlikowski, 1988)
- *ISS* ➔ Information Systems Success Model (DeLone & McLean, 1992)

EUCS: End-User Computing Satisfaction Instrument

In response to the increased adoption of end-user computers, Doll and Torkzadeh (1988) propose the *EUCS* instrument based on a study of 18 organisations. Their

second-order factor model consists of five dimensions – *content, format, accuracy, ease of use,* and *timeliness* – measured by 12 items. This exploratory instrument is validated through subsequent research by the authors (Torkzadeh and Doll, 1991; Doll *et al.* 1994). Confirmatory factor analysis is applied in one study (Doll *et al.* 1994) to examine the extent to which hypothesised factors hold good for new data. Their work tests four alternative models for the *EUCS* instrument. The authors argue that *EUCS* can be seen as a second-order factor based on goodness-of-fit indices. The *EUCS* instrument has been applied and validated by a number of authors (cf. Igbaria, 1990; Gelderman, 1998; McHaney & Cronan, 1998; McHaney *et al.* 2002; Somers *et al.* 2003). Whilst it measures satisfaction with an information system application, it fails to incorporate any direct measure of information service function delivery.

UIS: User Information Satisfaction

Another popular measure of information system success is Baroudi and Orlikowski's (1988) *UIS* scale. Based on the work of Bailey and Pearson (1983), the measure is designed to assess the products and services of an organisation's information systems function. The scale has been applied in a number of studies (Galletta & Lederer, 1989; Joshi, 1990). These have identified the three key dimensions of *UIS* as (1) *Quality of information product,* (2) *Staff and services,* and (3) *Users knowledge and involvement.*

The first dimension is concerned with the technical quality of an information system, whilst the second focuses on the attitudes of service providers and users perceptions of them. The last relates to the ability and willingness of users to participate in information systems development. Kettinger and Lee (1994) point to a number of problems with the *UIS* scale. Firstly, the scale focuses on measuring service elements found in large transaction processing environments rather than the end-user PC culture that tends to exits in modern organisations. Their second criticism is the lack of consistency in definitions used for *UIS* measures which leads to a fuzzy and incoherent construct.

ISS: Information Systems Success Model

DeLone and McLean (1992) propose a measure of information system success with six categories – *system quality, information quality, use, user satisfaction, individual impact,* and *organisational impact.* These variables are combined into the *'IS Success*

Pure Service: Computer services; Infomediaries: Selling information; Online travel agent: Selling value-added service; PCs: Selling a bundle of service and goods; Selling CDs: Selling goods; Pure Good

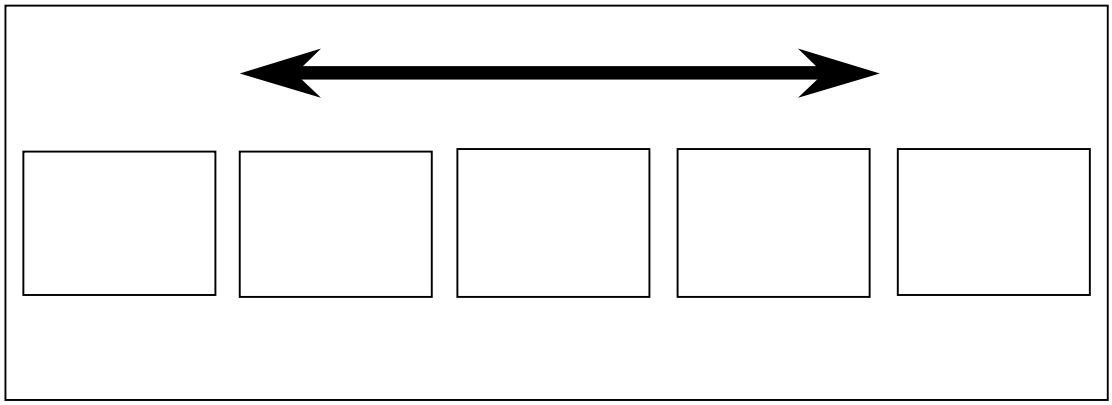
pure service

Model'. A limitation of their categorisation is that it is essentially product oriented (Pitt *et al.* 1995). For example, *systems quality* is concerned with software development and information processing, whilst *information quality* is concerned with output such as accuracy, timeliness, and reliability (Pitt *et al.* 1995; Jayasuriya, 1998). Pitt *et al.* (1995) note that because system and information quality precede other measures of information system success in their model, there is a strong bias towards product-orientation during measurement.

3.2.2 The Service Component in *Information Systems Quality*

Whilst the application of *EUCS*, *UIS* and *ISS* instruments is widespread, a number of problems with these traditional measures have been identified. Firstly, they are largely concerned with the products delivered by the information systems function (Rands, 1992; Pitt *et al.* 1995, 1997). However, in the modern business environment, such functions are also expected to deliver a significant service component to internal customers (Pitt *et al.* 1995). An information systems department is often responsible for assistance in installation, training, trouble-shooting, and maintenance (Jiang *et al.* 2002). Voss (2003) notes that goods and services along a spectrum of tangibility **(Figure 13)**, with few offerings exist at each extreme. In an information systems context, individual's are not simply concerned with hardware and software, they also expect installation assistance, training and ongoing support (Pitt *et al.* 1995).

Figure 13. Spectrum of Tangibility



EUCS, *UIS* and *ISS* scales all focus towards the goods end of Voss' spectrum. Jayasuriya (1998) suggests that provided the system itself is satisfactory (i.e.

hardware or software), it is people-oriented factors that are critical in determining overall perceptions of information systems quality. Increasingly, authors argue that service quality is an essential part of modern information systems delivery and should be explicitly measured (Pitt *et al.* 1995, 1997, 1999; Kettinger & Lee, 1997, 1999; Watson *et al.* 1998; Jiang *et al.* 2002). Recognising the need for better measures of information systems delivery, some researchers have examined the marketing field. The *SERVQUAL* scale has proved popular with those looking to include service components in information systems quality measures.

3.2.3 Measuring *Information Systems Quality* with *SERVQUAL*

In a U.S. research university, Kettinger and Lee (1994) combine the *UIS* measure and *SERVQUAL* in order to more adequately measure information systems function service delivery. They examine the relationship between dimensions of *SERVQUAL* and *UIS* and assess the extent to which service quality is significantly associated with 'information service function user satisfaction' (*USISF*). Confirmatory factor analysis provides evidence of strong reliability and validity for four original *SERVQUAL* factors – *reliability, responsiveness, assurance,* and *empathy.* The authors find that the *tangibles* dimension is not applicable. Regression procedures suggest that, in addition to the three *UIS* dimensions, *reliability* and *empathy* are significant predictors of *USISF*. This result indicates that these two dimensions are not adequately captured by the traditional *UIS* measure. The authors conclude that the scale benefits from the addition of service-oriented dimensions found in *SERVQUAL.*

Kettinger *et al.* (1995) go on to examine the validity of their *IS-SERVQUAL* instrument using organisations in four countries – Korea, Hong Kong, the United States, and Holland. Evidence to support the authors' four-dimension measure is provided in the U.S. and Dutch settings. However, in the Korean and Hong Kong solutions, factor structures differ. The authors claim this is due to an 'Asian factor'. They suggest that a localised version of the *IS-SERVQUAL* measure may be needed to capture the unique nature of information systems function perceptions in different settings.

Later work by Kettinger and Lee (1997) examines the dimensionality of *IS-SERVQUAL* across a range of campus settings. Their replication study concludes that the dimensions in this scale are consistent across settings. The authors also examine the relative merits of a perceptions-only and gap-approach to measuring information systems quality. They argue that slight improvements to predictive power, data collection efficiency, reliability, and construct validity, gained from the former must be weighed against the diagnostic value and data richness of the latter.

Pitt *et al.* (1995) assess the applicability of *SERVQUAL* for measuring information systems quality in a consulting firm, information service business, and a financial institution. In these three cases, analysis indicates 3, 5, and 7 factor-models, raising doubts over the discriminant validity of the five factors proposed by Parasuraman *at al.* (1988). However, despite such concerns, the authors conclude that *SERVQUAL* is appropriate for measuring information systems quality. They place service quality as an additional variable within DeLone and McLean's (1992) *IS Success Model.* Later work by the same authors (Pitt *et al.* 1997) defends their application of *SERVQUAL* against criticism made by Van Dyke *et al.* (1997). They provide evidence that the *gap-approach* to measuring service is well grounded in literature, and that concerns over reliability, dimensionality, and validity are not as serious as suggested by their detractors. They note the responses to criticisms of *SERVQUAL* from Parasuraman *et al.* 1994a, 1994b) and place great emphasis on the diagnostic value of paired statements.

Jiang *et al.* (2000) examine the application of *SERVQUAL* to an information systems setting through a large scale survey. Their study examines the factor structure of *SERVQUAL* and serves to cross-validate claims of external validity. Like Kettinger and Lee (1994), the authors explore the relationship between *IS-SERVQUAL* and the more widely accepted *UIS* measure. The significant relationship between the two constructs indicates that the former is an appropriate measure of information systems success. The authors conclude that after deleting the *tangibles* dimensions, the revised *SERVQUAL* measure has a high level of reliability and validity. Later work by this team (Jiang *et al.* 2002) tests *IS-SERVQUAL* from the viewpoint of the system service provider. Having dropped the *tangibles* dimension, their final model has four highly correlated dimensions consisting of 13 items.

3.2.4 Critique of *SERVQUAL* Application to *Information Systems Quality*

In addition to the debates already reviewed in the *Service Quality* and *ISQ* literature, there is a small body of work specifically examining *SERVQUAL* application in an information systems context (cf. Kettinger & Lee, 1994, 1997; Kettinger *et al.* 1995; Pitt *et al.* 1995, 1997; Dabholker *et al.* 1996; Van Dyke *et al.* 1997, 1999; Carr, 2002; Jiang *et al.* 2000, 2002).

Van Dyke *et al.* (1997, 1999) argue that disconfirmation theory is not appropriate in conceptualising information systems quality, instead favouring a *perceptions-only* approach to measurement (cf. Cronin & Taylor, 1994). Additionally, they note that there is a lack of consensus regarding the applicability of the 22 *SERVQUAL* items to an information systems context. Whilst Pitt *et al.* (1995) argue that the *SERVQUAL* items cover the domain completely others use additional items when modelling the construct (cf. Kettinger *et al.* 1995).

Van Dyke *et al.* (1997) argue that neither traditional measures such as *UIS* nor *SERVQUAL* capture all the factors that relate to perceived information systems service. They conclude that, using a single measure of service quality across industries is not feasible and therefore future research should involve the development of industry-specific measures of service quality.' (p199). Finally, Carr (2002) suggests that *IS-SERVQUAL* is actually two measures – *IS-SERVEXP* and *IS-SERVQPERF*. As such, both measures require rigorous validation before being accepted as appropriate for service measurement in an information systems setting.

Operationally, one of the problems with imposing *SERVQUAL* dimensions on respondents of information systems research is that they may not be applicable to the context (Jayasuriya, 1998). This is highlighted by the unstable dimensionality exhibited by *SERVQUAL* applications in information systems research (Van Dyke & Popelka, 1993; Kettinger *et al.* 1995; Pitt *et al.* 1995; Jayasuriya, 1998). For example, Pitt *et al.* (1995) find that three dimensions – *responsiveness, assurance* and *empathy* – show a lack of discrimination. Their factor analysis produces between 3 and 7 factors identified in three case settings. Employing critical incident technique, Jayasuriya (1998) finds the *assurance* dimension is too broad and suggests that it

should be split into two categories – *communication* and *competence.* Van Dyke & Popelka (1993) identify a uni-dimensional structure, whilst a later study by Van Dyke *et al.* (1997) finds only seven of the twenty-two items load cleanly on their respective factors. Many authors have found the *tangibles* dimension not to be applicable in an information systems setting (Rands & Cumberbatch, 1993; Pitt *et al.* 1995; Kettinger & Lee, 1994; Kettinger *et al.* 1995; Jayasuriya, 1998; Jiang *et al.* 2000, 2002).

In line with much external service literature, Van Dyke *et al.* (1997, 1999) point to the lower predictive power of a gap measure of information systems quality compared with a perceptions-only measure. Pitt *et al. (*1997) concede the marginally improved convergent and predictive validities of a perceptions-only scale, but argue that this is at the cost of valuable diagnostic capabilities. Kettinger and Lee (1997, 1999) broadly concur with the view that the gap-approach to measurement is appropriate despite operational problems with *SERVQUAL.* **Table 5** provides an overview of findings from these *SERVQUAL* applications.

Table 5. *SERVQUAL* Applications in *Information Systems Quality* Literature

Study	Instrument	Analysis	Factor Structure
Kettinger & Lee '94	22 original items	*CFA*	4-factor model, *Tangibles* N/A
Kettinger *et al.* '95	*ISF-SERVQUAL* (no *Tangibles*)	*PAF* by oblique rotation	Korea: 3-factor model Hong Kong: 4-factor model *Tangibles* retained in both
Pitt *et al.* '95, '97	22 original items	*PAF* by varimax rotation	5 factors, but poor convergence. 7 if *Tangibles* and *Empathy* split
Kettinger & Lee '97	13 items from *ISF-SERVQUAL*	*CFA*	4-factor model, *Tangibles* N/A
Van Dyke *et al.* '97	22 original items	*PAF* by oblique rotation	1 factor: SQ is uni-dimensional
Watson *et al.* '98	22 original items	Descriptive analysis of survey data	5 factors
Jiang *et al.* '00, '02	22 original items	*CFA*	4-factor model, *Tangibles* N/A

PAF – Principal Axis Factor Analysis
PCA – Principal Components Factor Analysis
CFA – Confirmatory Factor Analysis

3.2.5 Conclusion on *Information Systems Quality* Measurement

Information Systems Quality literature is clearly important in defining *Perceived EPQ.* In modelling the construct, measures such as *EUCS, UIS,* and *ISS* provide a variety of product variables that relate to e-procurement. However, there is an

increasing awareness of the service component within information systems delivery, considering training, problem resolution and maintenance. Therefore, traditional scales may not provide the full picture of internal customer perceptions. The *SERVQUAL* scale has proved popular with some researchers looking to explicitly measure service quality within information system settings. There are clearly concerns with applying *SERVQUAL* to information systems settings. Not withstanding theoretical issues already discussed, adapted scales typically exhibit unstable dimensionality (Van Dyke, 1999) and concerns over the discriminant validity, noted in a number of studies, may reflect the fact that the five *SERVQUAL* dimensions are simply inappropriate in an information systems context.

Jayasuriya (1998) argues that given the problems with *SERVQUAL*, exploratory research, similar to the early work of Parasuraman *et al.* (1985) is needed to develop the service quality dimensions for IT services. Carr (2002) concurs, arguing that consideration should be given to development of an instrument dedicated from its inception to the measurement of information systems quality. Whilst the disconfirmation paradigm provides an appropriate conceptual underpinning for measures, it appears that *SERVQUAL* is only partially valid in this context.

In conclusion, *Information Systems Quality* research provides the second pillar in delineating *Perceived EPQ.* In modelling the construct, both traditional measures (*EUCS, UIS,* and *ISS*) and adaptations of *SERVQUAL* provide a number of variables that relate to e-procurement delivery **(Table 6)**. However, it is argued that none of these scales are appropriate for measuring *Perceived EPQ* in their own right. The next section examines the final pillar upon which this research is based - *E-Service Quality* literature.

Table 6. Relevant Variables from *Information Systems Quality* Literature

VARIABLE NAME	Bailey & Pearson '83	Baroudi & Olilkowski '88	Doll & Torkzadeh '88, '91, '99	Davis '89	DeLone & McLean '92, '03	Kettinger & Lee '94, '97, '99	Kettinger *et al.* '95	Pitt *et al.* '95, '97, '99	Myers *et al.* '97	Van Dyke *et al.* '97, '99	Jayasuria '98	Watson *et al.* '98	Jiang *et al.* '00, '02	Somers *et al.* '03
Quality / Provision of Information	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Responsiveness	x					x	x	x	x	x	x	x	x	
Helpfulness	x					x	x	x	x	x	x	x	x	
Friendliness	x	x				x	x	x	x	x		x	x	
Empathy	x	x				x	x	x	x	x		x	x	
Flexibility						x	x	x	x	x	x	x	x	
Dealing with Problems						x	x	x	x	x	x	x	x	
Information Accuracy / Accurate Records	x		x		x	x	x		x				x	x
Support Availability						x	x	x	x	x	x		x	
Service Reliability / Support Reliability						x	x	x	x	x		x	x	
Well-dressed Employees						x	x	x	x	x		x	x	
Up-to-date Equipment						x	x	x	x	x		x	x	
System Reliability	x			x	x	x	x		x			x		
Visually Appealing Materials						x	x	x	x	x		x	x	
Politeness / Courtesy						x	x	x	x	x		x	x	
Individual Attention						x	x	x	x	x		x	x	
Trust						x	x	x	x	x		x	x	
Timely Information	x	x		x	x	x	x							
Customisation / Configurability	x				x	x	x							
System Speed	x				x	x	x							
Ease of Use			x		x				x					x
Complete Information					x	x	x		x					
Encouraging Feedback		x				x	x					x		
Training		x				x	x					x		
Access / Availability / Convenience	x				x	x	x							
System Integration	x					x	x							
Reporting / Management Information			x						x					x
Navigation			x	x	x									
Reliable / Unbiased / Trustworthy Information	x	x		x										
Talking User's Language						x	x				x			
Hardware Quality / System Quality / System Design	x	x			x									
Communication of Problems											x	x		
Content / Database Contents			x		x									
Visual Appeal of System	x													
Competence	x													
Timing of Training		x												
Approach to Training		x												
Format of Information			x											
Server Reliability									x					
Time Saving				x										

3.3 E-Service Quality

E-Service Quality (*E-SQ*) literature acts as the final pillar on which the *Perceived EPQ* construct is based. Service in the context of online retailing draw on two areas of literature already discussed - *Service Quality* and *Information Systems Quality.* Whilst

E-SQ research is focused on external customers, there are many commonalities with *Perceived EPQ.* Online order processes are often comparable to the requisition process within an organisation. Likewise, some of the service elements offered to external customers are applicable to e-procurement users. This section examines how *E-SQ* is measured by practitioners and then reviews the application of *SERVQUAL* to this research setting. This is followed by a discussion of other academic measures of *E-SQ.* Finally, conclusions are drawn on the value of *E-SQ* literature in delineating *Perceived EPQ.*

E-SQ Research

The vast majority of service research to date has explored service where a direct interaction between buyers and sellers exists (Sweeney & Lapp, 2004). However, far less work has focussed on *E-SQ*, where consumers have little or no interaction with the firm's employees (Meuter *et al.* 2000). According to Zeithaml *et al.* (2002) organisations with a web presence must consider how their customers evaluate and perceive online service. This requires defining *E-SQ*, identifying dimensions that make up the construct, and then measuring them. There is now a growing literature which examines the drivers of service quality in an online setting (cf. Szymanski & Hise, 2000; Donthu, 2001; Francis & White, 2002; Loiacono *et al.* 2002; Srinivasan *et al.* 2002a, 2002b; Bansal *et al.* 2004).

3.3.1 Practitioner Measures of *E-SQ*

There are a number of *E-SQ* measures developed by practitioners. Researching the factors that influence individuals to re-visit websites, Rice (1997) identifies key variables as *design features,* including content, layout, navigation, ease of locating information, and the *emotional experience*, such as excitement and enjoyment. *Transaction security* and *personal information security* are considered key drivers of customer perceptions of website performance by Balfour *et al.* (1998). Chen's (1999) scale measures attitudes towards corporate and institutional websites with a set of 141 adjectives in three dimensions – *entertainment, informativeness,* and *organisation.*

Liu and Arnett (2000) examination of web service quality in the *Fortune 1000* identifies five factors; *Quality of information:* relevant, accurate, timely, customised, complete; *Service:* response, assurance, empathy, follow-up; *System Use:* security, correct transaction, customer control, order-tracking, privacy; *Playfulness:* sense of enjoyment, interactivity, attractive features, enabling concentration; and *System Design:* organised hyperlinks, customised search, speed of access, ease of error correction.

BizRate.com has developed a service quality scale for online retailers with ten dimensions – *ease of ordering, product selection, product information, price, website performance, on-time delivery, product representation, customer support, privacy policies,* and *shipping and handling.* Research using this scale has found that *price* is the least important of the ten dimensions, whilst *customer support* is most critical in influencing customers' propensity to return to an e-retailers website. *Gomez.com* provides a measurement tool for online retailers based on the following dimensions: *ease of use, efficient access to information, customer confidence, reliability, years in business, relationship services,* and *overall cost.* The system relies on researchers' evaluation of these dimensions based on dummy transactions, interaction with service personnel, and site performance monitoring.

There are two key problems with these scales. Firstly, many of the studies do not detail the origin of items or the conceptual basis of their scales. Secondly, few practitioner-based studies attempt to empirically validate the dimensions that they employ (Zeithaml *et al.* 2002). Since 2000, a number of academics have taken a less arbitrary approach to defining and measuring *E-SQ*, drawing on *TAM, EUCS SERVQUAL*, or developing *E-SQ*-specific measures.

3.3.2 *E-SQ* Measures using *Information Systems* Research

A number of authors have used traditional approaches found in the *Information System* literature to model *E-SQ.* Some have based their approaches on the Technology Acceptance Model (*TAM*) as it relates to the Internet (Lederer *et al.* 2000). Whilst the *TAM* was originally developed to assess the performance of

software and IT adoption, more recent work has applied it to website quality (Lin & Lu, 2000; Liu & Arnett, 2000; Moon & Kim, 2001; Koufaris, 2002). Liu & Arnett, (2000) identify *information quality, system quality, use quality, playfulness, response time, system availability, ease of use* and *perceived usefulness* as critical in defining satisfaction with websites. Koufaris (2002) explores online consumers through the application of *TAM* and flow theory. Their findings suggest that the intention to repurchase is strongly influenced by perceived usefulness of a website. In addition, Abdinnour-Helm *et al.* (2005) use the *EUCS* instrument to measure website satisfaction, in a lab simulation project. The reliability and validity of the tool is assessed using confirmatory factor analysis. Their research suggests that whilst *EUCS* is appropriate for measuring website satisfaction, one of the sub-factors, *timeliness*, requires additional refinement to suite the context.

3.3.3 Measuring *E-SQ* using Adaptations of *SERVQUAL*

It is important to appreciate that websites provide service as well as products (Bitner *et al.* 2000; Watson *et al.* 2002; Sweeney & Lapp, 2004). Even for websites solely concerned with selling products, there are service elements such as product information, order and payment process, and after sales support (Barnes & Vidgen 2000). Trochim (1996) argues that in relatively homogenous markets – such as CDs, electrical appliances, and books – the service element is a critical discriminator among organisations. In the same way that information systems success measures are increasingly cognisant of service variables, so too have there been changes in attitudes towards success factors in online retailing. One popular approach to measuring *E-SQ* has been the application of *SERVQUAL* (cf. Zeithaml *et al.* 2000, 2002a, 2002b; Barnes & Vidgen, 2001a, 2001b; Zhu *et al.* 2002; Li *et al.* 2003; Gounaris & Dimitriadis, 2003; Voss, 2003; Long & McMellon, 2004).

Zeithaml *et al.* (2000) define *E-SQ*, as, 'the extent to which a web site facilitates efficient and effective shopping, purchasing, and delivery of products or services.' Their research identifies seven dimensions that relate to e-service and recovery – *efficiency, reliability, fulfilment, privacy, responsiveness, compensation,* and *contact.* The authors argue that the first four factors form the core of *E-SQ* and apply when

customers do not experience any problems. *Efficiency* considers the ease of finding a website, locating products or associated information, and checking out. *Fulfilment* refers to keeping service promises, having items in stock and delivering products on time. *Reliability* is concerned with site availability and how well it functions. *Privacy* incorporates data privacy and security of credit card information. Later research (Zeithaml *et al.* 2002a) examines three dimensions – *responsiveness, compensation,* and *contact* – which the authors argue are only relevant to customers who experience difficulties with the service. These *'recovery e-SERVQUAL'* dimensions consider return mechanisms and provision of online guarantees (*Responsiveness*), extent of money back provided (*Compensation*), and the availability of live service agents to deal with problems (*Contact*).

A third article by the team (Zeithaml *et al.* 2002b) examines differences between traditional service quality and *E-SQ.* The authors argue that expectations of *E-SQ* are not as well formed as those in traditional settings. They examine the dimensions of *SERVQUAL* and *e-SERVQUAL*, noting that around half of the of Parasuraman *et al's* (1985, 1988) dimensions are discussed in relation to *E-SQ*. *Reliability, responsiveness, access, assurance* and *customisation* are all relevant in both online and offline contexts. However, some of the perceptual attributes of *reliability* and *access* are concerned with specific online aspects such as system downtime and network availability. Furthermore, Zeithaml *et al.* concede that there are some entirely new dimensions and sub-dimensions of e-service, not found in traditional service settings. These include *ease of navigation, flexibility, efficiency, site aesthetics,* and *security.* These new dimensions are largely concerned with technology rather than customer services. One interesting finding is that *empathy,* a critical dimension in an offline context, appears not to be important to customers of online retailers except in cases of service recovery. The authors note that online buyers are typically goal oriented and are therefore not concerned with entertainment-related criteria. This finding is in line with much information system research, which questions the validity of the *tangibles* dimension.

Zhu *et al.* (2002) study the impact of IT on service quality in the consumer banking sector. Their work examines how perceptions of IT service impact on overall evaluations of service quality. They argue that the increased use of IT in service has

changed the nature of the service delivery and it is therefore important to include IT-specific attributes when measuring service quality. IT-based service variables include *ease of use, conservation of time, convenience, privacy, accuracy, multifunctional capabilities,* and *use of advanced IT,* whilst service quality is measured using *SERVQUAL*. Data analysis indicates that perceptions of IT-based services are directly influenced by *reliability, responsiveness,* and *assurance* dimensions. The authors also note that customer *experience with IT-based services* has a significant mediating effect on perceptions of IT-based services. Those with more experience tend to value and rate IT-based services more highly. Finally, Zhu *et al.* (2002) conclude that *tangibles* do not have a significant impact on performance perceptions. They argue that *tangibles* is no longer 'motivation' factor, capable of winning orders, but simply a 'hygiene' factor, whose absence will lose orders.

Voss (2003) examines how *SERVQUAL* might be modified in an *E-SQ* environment. He argues that only the *empathy* dimension lacks applicability in an online setting. Additionally, Voss proposes a sand cone model of e-service based on the work of Ferdows and DeMeyer (1990), with three levels of web service quality – *the foundation*, comprising of responsiveness, ease of navigation, web-site effectiveness, and fulfilment and delivery; *customer centred service,* which incorporates trust, information and status, and configuration/customisation; and *value added*, the final stage adding value through e-service including proactive service, value added service, and e-service as an experience. Voss concludes that the model underlying *SERVQUAL* is based on human interaction and as such may not transfer well to an online setting. Whilst some of the original ten service criteria are applicable to e-service, they might cluster in different ways to those posited in the *SERVQUAL* scale (Parasuraman *et al.* 1988).

Long and McMellon (2004) measure perceived online service quality based on analysis of online customer comments. Clustered comments are compared to the *SERVQUAL* dimensions. Many of the 53 items fit with Parasuraman *et al's* dimensions. However, two additional dimensions are identified – *communication* and *ordering/shipping/packaging. Communication* is concerned with clarity, content and the ease of communicating with sellers if problems emerge. The second factor considers shipping options, returns policies, ease of purchase, and ease of

cancellation. Factor analysis suggests 19 items making up five dimensions – *tangibility, assurance, purchasing process, reliability, responsiveness. Empathy* and *assurance* combine to form *assurance, ordering/shipping/packaging* is renamed *purchasing process,* and *communication* is dropped entirely. The authors argue that online service measurement is less reliant on interpersonal interaction and more focused on technology aspects of service delivery.

Barnes and Vidgen, (2000, 2001a, 2001b, 2002) propose an adapted *SERVQUAL* scale for measuring the quality of websites – *WebQual.* The model is made up of three dimensions – *usability, information* and *interaction* – comprising of 22 items. Li *et al.* (2003) adapt *SERVQUAL* to apply to 'the information age.' Given the differences between web-based and traditional customer service, the authors propose replacing the *tangibles* dimension with an 'intangible' dimension – *quality of information* – and add a second new dimension – *integration of traditional and web-based communication.* Examining perceptions of service quality delivered via B2C portals, Gounaris and Dimitriadis (2003) identify three quality dimensions – *customer care* (concern, ease of communication, security, response), *information benefit* (reliable, complete and up-to-date information, personal interest, security of personal information), and *interaction* (technology, design, speed, functionality) – based on the *SERVQUAL* model and previous research.

In conclusion, attempts to adapt *SERVQUAL* to *E-SQ* have in fact demonstrated the scales' limitations in an on-line setting. Even Zeithaml *et al.* (2002b) concede that *ease of navigation, flexibility, efficiency, site aesthetics,* and *security* are new dimensions/sub-dimensions of *E-SQ*, which are not found in traditional service settings. Additionally, it is clear that the 'goal orientation' of some on-line customers raises questions over the validity of the *tangibles* dimension. The addition of various extra dimensions in much of the research predicated on *SERVQUAL* indicates that the scale does not fully cover aspects of *E-SQ* (cf. Barnes and Vidgen, 2001a, 2001b; Zhu *et al.* 2002; Long and McMellon, 2004). Parasuraman *et al.* (2005) note that, 'studying e-SQ requires scale development that extends beyond merely adapting offline scales' (p215). **Table 7** summarises key findings from *SERVQUAL* applications in the *E-SQ* literature.

Table 7. *SERVQUAL* Applications in *E-SQ* Literature

Study	Instrument	Analysis	Factor Structure
Barnes & Vidgen '00, '01a,b '02	22 items based on *SERVQUAL* + workshop	*PCA* by varimax rotation	3 factors: *usability, info quality,* and *service interaction quality*
Zeithaml *et al.* '00, '02a+b	22 items based on *SERVQUAL* + focus groups	*PFA* by oblique rotation	7 factors: *efficiency, fulfilment, reliability, privacy, content, compensation, responsiveness*
Zhu *et al.* '02	22 original items	*PFA* by oblique rotation	3 factors, 1 combining *reliability, responsiveness,* and *assurance*
Voss '03	10 PZB ('85) factors	Descriptive analysis of survey data	10 factors, *Empathy* N/A. Original 10 may cluster in different ways in *E-SQ* context
Gounaris & Dimitriadis '03	14 items based on *SERVQUAL*	*PCA*	3 factors: *care, information,* and *interaction*
Long & McMellon '04	53 items 'guided' by *SERVQUAL*	*PCA* by varimax rotation	5 factors: *tangibility, assurance, reliability, responsiveness,* and *purchase process*

PAF – Principal Axis Factor Analysis
PCA – Principal Components Factor Analysis
CFA – Confirmatory Factor Analysis

3.3.4 Other Academic Measures of *E-SQ*

Cox and Dale (2001) state that Johnston's (1995) traditional service aspects such as *accessibility, communication, credibility, understanding, appearance* and *availability* remain applicable to online settings. However, they argue that *competence, courtesy, cleanliness, comfort, helpfulness, care, commitment,* and *flexibility* are less likely to be applicable to e-service. Likewise, Long & McMellon (2004) note that given the human-interaction implicit in the majority of *SERVQUAL's* scale items, online customers will either evaluate these dimensions differently or reply upon entirely different dimensions. In particular, the tangible elements of traditional service, such as physical facilities, equipment, and appearance, are often viewed as unimportant in online settings (Jayasuriya, 1998; Gounaris & Dimitriadis, 2003). The normal visual or audio cues found in tradition service settings are either different or absent altogether online (Long & McMellon, 2004). A number of academics have independently developed *E-SQ* measures.

For example, Loiacono *et al.* (2000, 2002) develop an evaluation tool called *WEBQUAL* based on work with website designers. Their scale has 36 items and 12 dimensions – *informational fit to task, interaction, trust, response, time, design, intuitiveness, visual appeal, innovativeness, flow, integrated communication, business*

processes, and *substitutability.* The *WEBQUAL* dimensions are generally focused on *technical quality,* rather than service elements. Additionally, the perceptions of actual purchasers are not measured. Instead, the authors rely on students visiting websites and evaluating on the basis of their twelve *WEBQUAL* dimensions. As such, the scale is not a measure of service quality from a customer perspective.

Wolfinbarger and Gilly's (2001, 2003) proposed *.comQ* scale has four dimensions made up from fourteen items: *Website design* includes items of design and one considering personalisation. *Reliability* considers accurate representation of products, and orders that are accurate and delivered on-time. *Privacy/security* relates to trusting the site and feeling safe. *Customer service* involves, speed of response, willingness to help, and interest in solving problems. Their research involves the use of a literature review, focus groups, a sorting task, and an online survey.

Using content analysis of online shopping anecdotes, Yang *et al.* (2003) identify 42 items representing 14 service quality dimensions – *responsiveness, credibility, ease of use, reliability, convenience, communication, access, competence, courtesy, personalisation, continuous improvement, collaboration, security / privacy,* and *aesthetics.* The first six factors account for 89.9% of all comments, with *responsiveness* the most important (30.3% of all comments). They argue that whilst price and product quality are essential pre-requisites to online success, sustained competitive advantage can only be achieved through the provision of excellent service delivery. The authors also state that five service quality dimensions – *convenience, continuous improvement, collaboration, security / privacy, aesthetics* – are not found in either *SERVQUAL* (Parasuraman *et al.* 1988) or the *EUCS* model (Doll & Torkzadeh, 1988).

Sweeney and Lapp (2004) employ critical incident technique to explore the events that lead to high and low perceptions of website quality. Based on the work of Bitner (1990) and Bitner *et al.* (1994) and Gremler *et al.* (1994), they examine service quality delivered through websites at the encounter level. The study distinguishes between *'goal-directed'* and *'experiential'* customers. *Goal-directed* shopping occurs when the customer has a specific purchase in mind (Paden & Stell, 2000) and is therefore most interested in a quick visit to a website 'in which they have optimum

control and can achieve their objectives with minimal fuss' (p278, Sweeney & Lapp, 2004). *Experiential* customers are more interested in the shopping experience, they desire to be 'drawn in' to the service and to have a high level of choice. Based on content analysis, three categories – *ease of use, content* and *process* – emerge as critical in assessing website quality. The most important category, *Ease of use*, includes instructions and explanations, design and layout, and navigation. *Content* is concerned with depth, correctness, and presentation, whilst *process* considers control and speed. In the same vein as Johnston (1995) and Voss (2003), Sweeney and Lapp (2004) argue that some aspects – *hygiene factors* – are considered a basic minimum of the service offering and will create dissatisfaction if they are not present. *Enhancing factors* are more positive in nature and can delight customers if they are present.

Based on a sample of 145 firms, Bansal *et al.* (2004) research the relationships between *E-SQ* and customer retention in the online environment. They note that because the attitude of the service provider is difficult to assess, perceptions of service are likely to be driven by different factors in on-line and off-line settings. Their research proposes that *ease of use, availability of information, product selection, price, transaction duration, customer service,* and *shipping and handling* will all be significantly related to overall website satisfaction. Factor analysis reveals two factors influencing overall website satisfaction. The first – *Web site characteristics* – is made up from the first five categories. The factor is primarily concerned with the functionality of the website and reflects Davis' (1989) *ease of use* and *usefulness* factors. *Customer service* and *shipping and handling* make up a second factor called *Customer service,* reflecting the service received during and after purchase. Additionally, the authors argue that overall *E-SQ* accounts for 38% of variance in *referral and retention,* and 25% in *conversion.*

Using mixed methods research, Lim and Dubinsky (2004) identify four e-shopping attributes – *merchandise, interactivity, reliability,* and *navigation. Merchandise* is concerned with product information and the variety of merchandise. *Interactivity* focuses on the support and services provided by the online retailer. *Reliability* considers reputation, security, and privacy. Finally, *navigation* is defined as the time it takes to access a website and to subsequently download web pages. Multiple regression analysis reveals that the attitude toward online purchasing is a positive

function of both *merchandise* and *reliability.* However, attitudes are not significantly related to *interactivity* or *navigation.*

SITE-QUAL, a measure of perceived quality of online shopping sites, is proposed by Yoo and Donthu (2001). The nine-item scale has four dimensions – *ease of use, aesthetic design, processing speed* and *security.* Yang and Jun (2002) identify six dimensions of service for Internet users – *reliability, access, ease of use, personalization, security,* and *credibility.* They also note that *responsiveness* and *availability* are only applicable to non-electronic customers.

3.3.5 Conclusion on *E-SQ* Measurement

In seeking to delineate *Perceived EPQ,* the *E-SQ* literature has proved very useful. This section has examined how *E-SQ* is measured by both practitioners and academics. Whilst the work has an external customer perspective, many of the variables used are relevant to an e-procurement setting.

TAM and *EUCS* approaches to *E-SQ* measurement tend to be technology, rather than service, oriented, whilst practitioner measures often lack conceptual underpinning or empirical validation. The addition of extra dimensions in much of the research predicated on *SERVQUAL* points to an inability of the scale to adequately cover all aspects of *E-SQ* (cf. Barnes and Vidgen, 2001a, 2001b; Zhu *et al.* 2002; Zeithaml *et al.* 2002b; Long and McMellon, 2004).

Academic attempts to scale *E-SQ* from scratch have produced a wide variety of measures. This work indicates that *ease of use* and *security* play an important role in determining perceptions of online service. Whilst *ease of use* has many labels (e.g. ease of understanding, ease of navigation, site design) and different measures (e.g. user friendly site, easy to locate information, easy to use), it reflects the ease of navigating around a system. *Customer security* incorporates privacy, transaction security, and financial security. Beyond these concepts, there seems to be little consensus on factors that drive e-service perceptions.

Whilst *E-SQ* acts as one pillar on which the *Perceived EPQ* construct is based, there are limits to its applicability to an e-procurement setting. Firstly, *E-SQ* research is based almost entirely in an online setting, where the interaction is non-personal (Long & McMellon, 2004; Szymanski & Hise, 2000). However, in an offline context, the service encounter plays a vital role in determining perceptions of service (Bitner *et al.* 1994). *Perceived EPQ* spans both on-line and off-line elements of service delivery and as such can only partially draw on *E-SQ* literature in identifying variables for study. Additionally, there are elements of *Perceived EPQ* that are directly concerned with its internal setting. For example, variables relating to *FMS* integration, authorisation channels, and invoicing procedures may be important to individuals within organisations, but not to end-consumers. Likewise, the provision of training and support is more limited in an external context than for internal customers. **Table 8** provides a summary of variables used in *E-SQ* measurement.

Table 8. Relevant Variables from *E-SQ* Literature

VARIABLE NAME	Rice '97	Chen '99	Barnes & Vidgen '00, '01, '02a+b	Lederer *et al.* '00	Lin & Lu '00	Liu & Arnett '00	Lociancono *et al.* '00. '02	Zeithaml *et al.* '00, '02a + b	Wolfinbarger & Gilly '01, '03	Yoo & Donthu '01	Koufaris '02	Yang & Jun '02	Zhu *et al.* '02	Trocchia & Janda '03	Voss '03	Yang *et al.* '03	Gounaris & Dimitriadis '03	Bansal *et al.* '04	Lim & Dubinsky '04	Long & McMellon '04	Sweeney & Lapp '04	Abdinnour-Helm *et al.* '05	BizRate.com	Gomez.com
Communication / Information Quality		x	x	x	x	x	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x
Navigation	x		x	x		x	x	x	x	x			x	x	x	x	x	x	x	x	x		x	
Visual Appeal / Aesthetics		x	x	x		x	x	x	x	x		x		x		x	x	x	x	x				
Confidentiality / Personal Information Security			x			x	x	x	x			x	x	x	x	x	x		x	x			x	x
Server Speed / Access Speed	x			x	x	x	x	x	x				x		x	x	x			x	x			
Transaction Security						x	x	x	x	x		x	x	x		x	x		x	x				
On-time Delivery			x				x	x	x			x		x	x	x		x	x	x			x	
Ease of Use	x		x				x		x		x		x			x				x	x	x	x	x
Order Accuracy			x						x			x	x	x	x	x		x		x			x	x
Responsiveness								x	x			x	x		x	x	x	x		x			x	
Search / Finding Information	x					x		x	x		x				x			x	x	x	x			
Efficiency / Processing Speed								x	x	x				x	x	x		x	x	x	x			
System Reliability			x		x	x		x	x				x	x	x	x				x				
Support Availability								x	x			x	x			x	x			x				
Dealing with Problems						x		x	x				x	x		x				x				
Information Accuracy			x	x		x											x			x	x	x		
Content / Selection / Variety	x								x			x		x				x	x				x	
Complete Information			x	x		x			x								x					x	x	
Customisation / Configuration / Personalisation			x			x		x	x			x			x									
Support Flexibility						x		x	x				x			x				x				
Support Reliability												x	x			x		x		x				x
Concern & Empathy									x				x			x	x			x				
Encouraging Feedback												x				x			x	x				
Reputation of Business			x													x			x					x
Lead-time / Fulfilment															x	x		x					x	
Knowledge															x	x		x		x				
System Quality / Capability						x							x				x						x	
Ease of Understanding				x								x				x								
Excitement / Enjoyment	x	x				x																		
Friendliness																x				x				
Stock Availability								x				x												
Timely Information			x																			x		
Relevant Information			x			x																		
Proactive Service															x									x
Trust							x								x									
Structural Design & Layout	x																				x			
Server Reliability																				x				
Number of Process Stages																					x			
Number of Catalogues																			x					
Self Learning																				x				
Up-to-date Equipment																				x				
Training															x									
Compensation								x																
Ease of Cancellation																				x				
Returns Policies																				x				
Order Tracking						x																		

3.4 Research Questions

Within the *E-Procurement* literature, *Perceived EPQ* has been identified as important in driving both system and contract compliance. In addition, as noted in the *Information Systems* section, there is extensive empirical evidence to support the relationship between perceptions of information systems and adoption practices. However, what is clearly lacking is a detailed exploration of the *Perceived EPQ* construct. Given its likely importance in influencing e-procurement adoption and ultimately procurement expenditure, this study seeks to model *Perceived EPQ* and develop a tool for its measurement. This requires identifying the components and structure of *Perceived EPQ,* and examining how measurement can be operationalised. In addition, the study aims to examine the contingencies in which different measurement approaches may be most applicable. Research objectives give rise to the following questions:

RQ1: What are the components of Perceived EPQ?

Clearly, the literature review provides a valuable start point for the first research question. Studies in *E-Procurement, Service Quality, Internal Service Quality, Information Systems Quality* and *E-Service Quality* present a wide variety of potential components for consideration in the study. However, as the literature review demonstrates, no one scale or model is generically applicable to an e-procurement setting. For managers and academics to understand *Perceived EPQ* it is important to effectively delineate the construct through empirical research.

RQ2: What is the structure of Perceived EPQ?

In many instances, managers need identify gaps between expectations and perceptions for specific issues (i.e. for each component). However, in other cases, it is useful to condense variables into a small subset of factors, whilst retaining the essential character and explanatory power of the original variables (Hair *et al.* 1998). Factors are useful for academics, because they simplify multivariate analysis. For practitioners, they can provide a small set of concepts to consider in strategic

decision-making. Therefore, it is useful to examine how components group in broader factors (a.k.a. dimensions).

RQ3: How can Perceived EPQ measurement be operationalised?

There are a number of alternative ways in which service quality measurement can be operationalised. As noted in section 2.2.8, different issues may determine whether a paired-statement or a single-statement approach is most suitable in operationalising *Perceived EPQ* measurement (cf. Carman, 1990; Babakus & Boller, 1992; Kettinger, 1995). Therefore, it is possible to propose alternative calculation approaches for *Perceived EPQ* and to explore contingencies that render each most appropriate. Different research objectives – contingencies – for a researcher or a practitioner may point to different calculation options for *Perceived EPQ* measurement.

Summary

In seeking to understand how best to model *Perceived EPQ*, various areas of literature have been examined. The study supports the use of disconfirmation theory, found in much of the *Service Quality* literature. At an operational level, *E-Procurement, Internal Service Quality, Information Systems Quality,* and *E-Service Quality* literatures are useful in creating a pool of potential *EPQ* components. Whilst *SERVQUAL* has been applied by a number of academics, there are a number of operational concerns raised by its use in the three literature pillars. Content validity is questioned by the need for extra dimensions not incorporated in the *SERVQUAL* scale (cf. Reynoso & Moores, 1995; Fierens, 1997; Van Dyke *et al.* 1997; Lings & Brooks, 1998; White & Rudall, 1999; Barnes & Vidgen, 2001a, 2001b; Zeithaml *et al,* 2002; Zhu *et al.* 2002; Long & McMellon, 2004). Construct validity is questioned by unstable dimensionality and the broad rejection of the *tangibles* dimension (cf. Kettinger *et al.* 1995; Young & Varble, 1997; Auty & Long, 1999; Brooks *et al.* 1999; Kuei, 1999; Zhu *et al.* 2002). Finally, the relative power of scales based on the gap-approach as opposed to the perceptions-only approach raises some concerns over the predictive validity of *SERVQUAL* (cf. Van Dyke *et al.* 1997, 1999).

As a result of these issues, there have been calls for the development of context-specific measurement scales (cf. Reynoso & Moores, 1995; Jayasuriya, 1998; Carr, 2002). Within *Internal Service Quality* research, scales developed in a procurement setting are particularly useful for purchase-specific variables of *Perceived EPQ*, whilst broader work offers interesting insights in terms of support. Whilst early *Information Systems Quality* literature is most closely related to product elements of e-procurement, there is an increasing awareness of the service component in systems delivery. Finally, *E-Service Quality* research provides a wide variety of measurement scales, most of which highlight the importance of *ease of use* and *security* in determining perceptions of online service.

Whilst the work of Parasuraman*,* Berry and Zeithaml clearly has value, it may be more appropriate to develop a scale dedicated to the measurement of *Perceived EPQ* than to apply the *SERVQUAL* scale to an e-procurement context. The study supports the view that separate expectations and perceptions data should be collected in the first instance. However, it acknowledges that operationalising *Perceived EPQ* measurement may ultimately apply a single-statement approach depending on different contingencies (cf. Carman, 1990; Babakus *et al.* 1993). Within the three pillars of literature, no appropriate measure of *Perceived EPQ* has been identified. However, the studies do provide an extremely valuable set of potential variables for consideration in scale development.

Table 9 provides a summary of variables identified in the literature review that are useful in delineating the *Perceived EPQ* construct. The table shows the number and percentage of authors referring to variables in the three operational areas of literature, essentially summarising tables 4, 6, and 8. Whilst it is impossible to include every variable from every piece of literature reviewed, the list provides a useful review of from 65 key authors in nearly a hundred journal articles.

Table 9. Relevant Variables from Literature Review

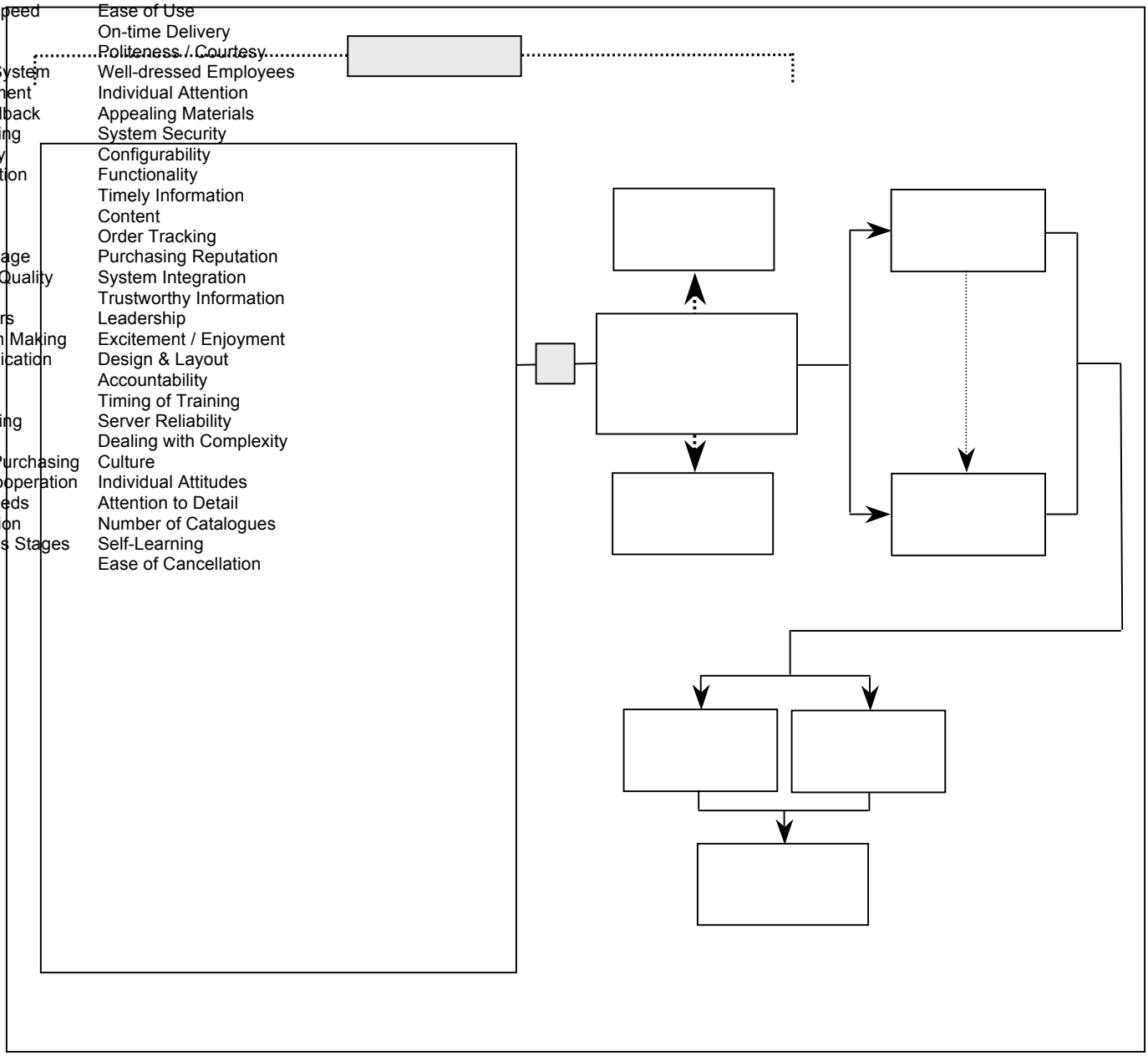
VARIABLE NAME	*Internal Service Quality* N = 26	*Info Systems* N = 14	*E-Service Quality* N = 24	*%* **N = 64**
Quality / Provision of Information / Communication	18	14	20	**81.3**
Responsiveness / Promptness	22	9	10	**64.1**
Concern / Empathy	21	9	5	**54.7**
Support Flexibility	19	8	6	**51.6**
Support Availability / Resources	19	7	7	**51.6**
Dealing with Problems	17	8	7	**50.0**
Service Reliability / Support Reliability / Dependability	19	7	6	**50.0**
Friendliness	16	9	2	**42.2**
Competence / Skills / Knowledge	20	1	4	**39.1**
Confidentiality / Integrity / Personal Information Security	10	0	15	**39.1**
Accurate Information / Accurate Records	6	8	7	**32.8**
Navigation	0	3	18	**32.8**
Helpfulness / Assistance	10	9	0	**29.7**
System Reliability	1	7	10	**28.1**
System Speed / Capacity & Speed / Server Speed / Access Speed	1	4	13	**28.1**
Ease of Use	1	4	12	**26.6**
Trust	8	7	2	**26.6**
On-time Delivery / Reliability	5	0	12	**26.6**
Order Accuracy / Service Accuracy	5	0	11	**25.0**
Politeness / Courtesy	9	7	0	**25.0**
Visual Appeal of System / Aesthetics	0	1	15	**25.0**
Well-dressed Employees	8	7	0	**23.4**
Up-to-date Equipment	7	7	1	**23.4**
Individual Attention	7	7	0	**21.9**
Encouraging Feedback	6	4	4	**21.9**
Visually Appealing Materials	7	7	0	**21.9**
Speed of Processing / Efficiency / Processing Speed	3	0	10	**20.3**
System Security / Transaction Security	1	0	12	**20.3**
Access / Availability / Convenience / Accessibility	8	4	0	**18.8**
Customisation / Configurability / Personalisation	1	4	6	**17.2**
Complete Information	0	4	7	**17.2**
Functionality / Hardware Quality / Infrastructure / Capability / System Quality / System Design	3	3	4	**15.6**
Search / Finding Information	0	0	10	**15.6**
Timely Information / On-time Information	1	6	2	**14.1**
Training	4	4	1	**14.1**
Content / Database Contents / Selection / Variety	0	2	7	**14.1**
Lead-time / Cycle time / Fulfilment	5	0	4	**14.1**
Talk User's Language / Interpersonal Skills / Ease of Understanding	2	3	3	**12.5**
Reputation of Purchasing / Reputation of Business	2	0	4	**9.4**
Quality of Service or Product	4	0	0	**6.3**
System Integration	1	3	0	**6.3**
Reporting / Management Information	0	3	0	**4.7**

Continued…

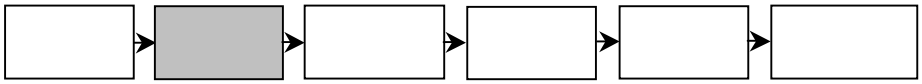
VARIABLE NAME	*Internal Service Quality* N = 26	*Info Systems* N = 14	*E-Service Quality* N = 24	*%* **N = 64**
Reliable / Unbiased / Trustworthy Information	0	3	0	**4.7**
Managing Suppliers	3	0	0	**4.7**
Leadership	3	0	0	**4.7**
Proactive Decision Making / Proactive Service	1	0	2	**4.7**
Excitement / Enjoyment	0	0	3	**4.7**
Communication of Problems	0	2	0	**3.1**
Format / Structural Design & Layout	0	1	1	**3.1**
Stock Availability	0	0	2	**3.1**
Accountability	2	0	0	**3.1**
Rewards	2	0	0	**3.1**
Timing of Training	0	1	0	**1.6**
Approach to Training	0	1	0	**1.6**
Server Reliability	0	1	0	**1.6**
Time Saving	0	1	0	**1.6**
Dealing with Complexity	1	0	0	**1.6**
Interactions with Purchasing	1	0	0	**1.6**
Culture	1	0	0	**1.6**
Shared Goals / Cooperation	1	0	0	**1.6**
Individual Attitudes	1	0	0	**1.6**
Understanding Needs	1	0	0	**1.6**
Attention to Detail	1	0	0	**1.6**
Relevant Information	0	0	1	**1.6**
Number of Catalogues	0	0	1	**1.6**
Number of Process Stages	0	0	1	**1.6**
Self-Learning	0	0	1	**1.6**
Compensation	0	0	1	**1.6**
Ease of Cancellation	0	0	1	**1.6**
Returns Policies	0	0	1	**1.6**
Order Tracking	0	0	1	**1.6**

Figure 14 shows an early iteration of the *EPQ Model*, based on the literature review, and highlights the area of the model examined in this study. At this stage, possible components of *Perceived EPQ* are the 72 variables from literature sources. Having examined relevant literature, the next chapter explores options on how best to tackle the research questions.

Figure 14. ***EPQ Model*** **(Post-Literature Review)**



Chapter 4: Research Design & Methods



The choice of research design and methods is guided by research objectives, questions, antecedent literature, and philosophical position (Gummesson, 1991). The first section in this chapter examines the philosophical options related to ontology, epistemology, human nature, and methodology. The second section examines research design and method options, considering level of interference, time horizon, research approach, and methods. The third section presents the decisions made concerning philosophy, research design and methods for the study. This is followed by more specific detail of the approach selected. Finally, tactics for ensuring quality of research are reviewed.

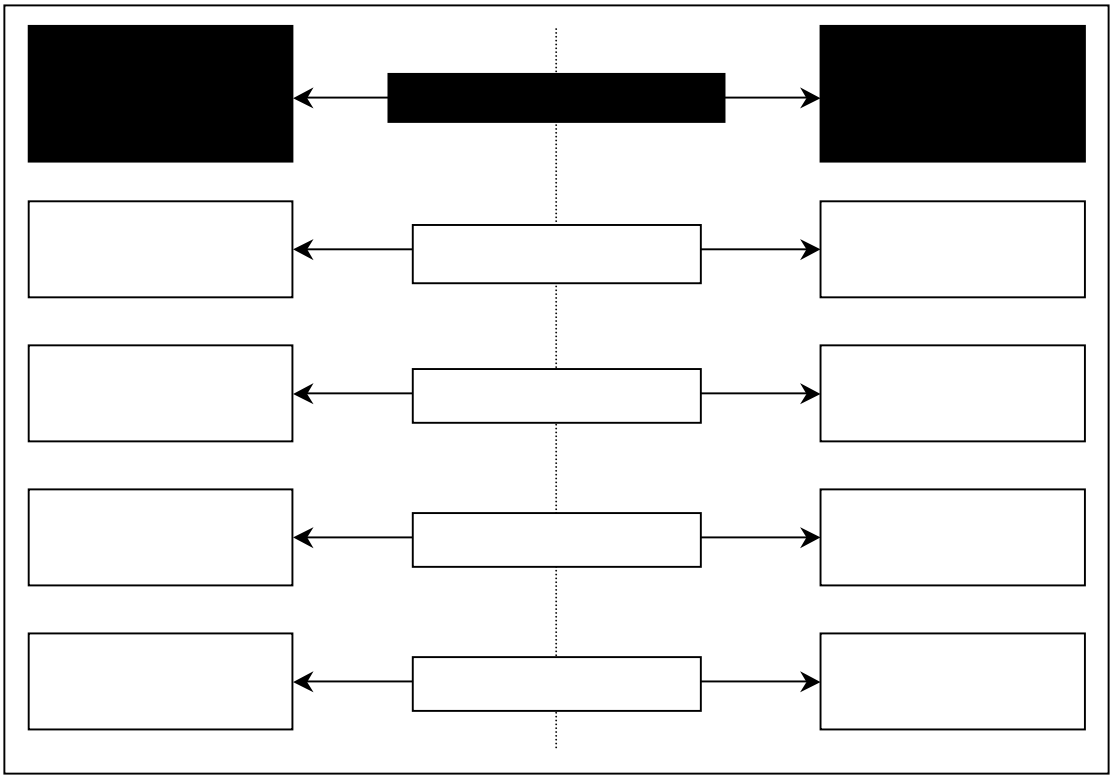
4.1 Philosophical Options

This section examines the choice of meta-theoretical assumptions for the study. The main focus of any research is to adopt an approach that will provide insights into questions posed. This is by no means an easy challenge, because research has at its heart the question whether 'truth' is the product of pure reason (objective, testable, rational, perspective-free) or will always be value-laden and context-dependent (subjective, irrational). Burrell & Morgan (1979) argue that research is grounded on philosophical (meta-theoretical) assumptions, which support different approaches to inquiry and method selection. These assumptions are classified into four areas – *ontology, epistemology, human nature,* and *methodology* **(Figure 15).** Each is now discussed in turn.

4.1.1 Ontological Assumptions

Ontology is the theory of reality. Questions concern the existence of entities, the fundamental nature of 'being', and the extent to which social structures are independent of the individuals from which they are composed. Burrell and Morgan

Figure 15. A Schema for Analysing Assumptions about the Nature of Social Science



(Burrell and Morgan, 1979)

(1979) coin two extreme ontological positions as *Realism* and *Nominalism*. The realist perspective assumes that there exists an objective external reality and that individuals do not significantly impact on what is being observed. The nominalist perspective assumes that the reality of social phenomena is the product of an individual's minds and can therefore be interpreted in many different ways.

4.1.2 Epistemological Assumptions

Epistemology is concerned with how ontological assumptions are manifested in research. As such, it focuses on what can be known and how knowledge is generated. The dichotomy of philosophical positions is coined in a number of different ways; *Positivism* versus *Anti-Positivism* (Burrell & Morgan, 1979); *Positivism* versus *Phenomenology* (Easterby-Smith *et al.* 1991; Gill & Johnston, 1991); *Quantitative Methodology* versus *Qualitative Methodology* (Bryman 1988); *Rational* and *Existential* (Meridith *et al.* 1989); *Mental Determinism* and *Material Determinism* (Hirschmann & Holbrook, 1992). The key difference between these paradigms is

whether knowledge is objectively knowable (i.e. acquired) or subjectively knowable (i.e. personally experienced).

Positivism

Within the positivist paradigm the researcher seeks the *fact* or *causes* of social phenomena with little regard for the subjective states of individuals (Miles & Huberman, 1994). Whilst reality may be extremely complex in the social world, positivist writers argue that it can be measured and results used to predict future behaviour. The assumption that there are ways to generate truth is highly contested (Kuhn, 1962). Positivism is charged with ignoring perceptions, values, context and socio-historical complexities of human behaviour. This final criticism is particularly important in the social world constituted through language and meaning, and where most research involves a degree of human interference.

Anti-Positivism

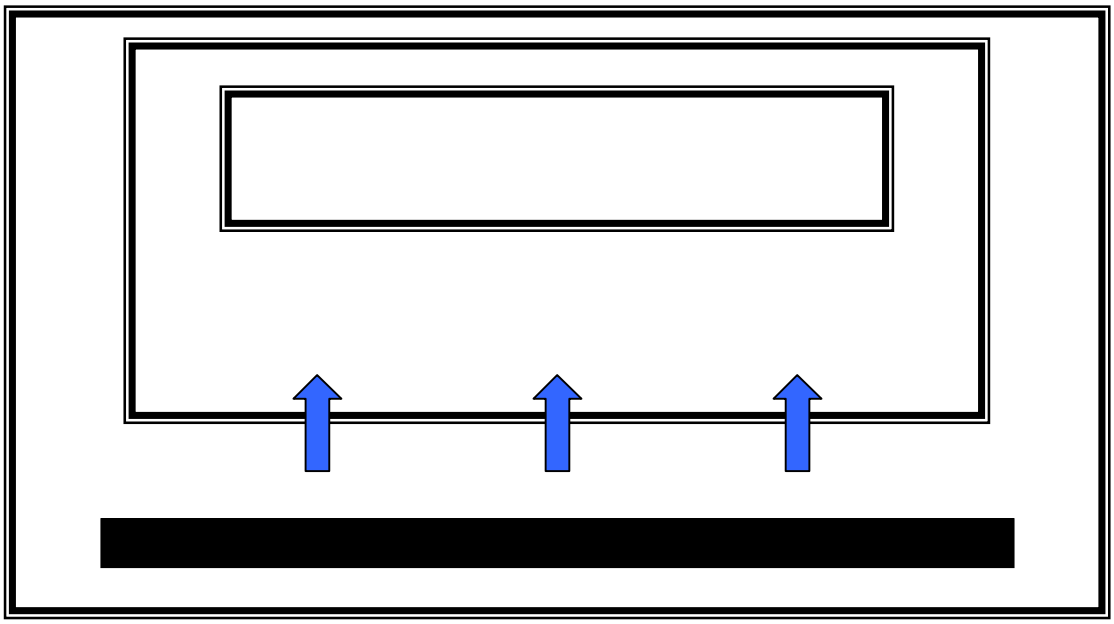
The anti-positivist standpoint recognises the importance of perception and interpretation in the process of defining, collecting and analysing research evidence. Those advocating anti-positivism argue that 'truth' is evasive. Different people can describe the same experience in very different ways and yet be 'telling the truth'. An individuals' truth is determined by interpretations, prejudices, and exaggerations. Not only do people interpret events differently, they also focus their attention on different things. Truth emerges not as one objective view, but rather as the composite picture of how people think about a certain issue. However, anti-positivism is charged with focusing too heavily on individual cases, whilst ignoring general truths. Some argue that science should be seen simply as a practical tool from which a consensus of truth can and should be established – which can then be refuted by subsequent research (Popper, 1963). Additionally, there exists the criticism that the results of research are based on the unknowable impact of the researcher by their intervention.

Critical Realism (Post-Positivism)

Between the extreme social science paradigms of positivism and anti-positivism, lies critical realism (Hunt, 1991). Critical realism establishes a realist view of 'being' in the ontological domain whilst accepting relativism of knowledge as socially and historically conditioned in the epistemological domain **(Figure 16)**. Whilst social

structures are 'real', they are localised in both time and space. Unlike material phenomena, they are inherently interactive and difficult to predict, so measurement is limited and comparison almost impossible.

Figure 16. The Real, the Actual, and the Empirical



Mingers, 2001

4.1.3 Human Nature Assumptions

Assumptions concerning human nature explore the relationship between humans and their environment and are termed *Determinism* and *Voluntarism* (Burrell & Morgan, 1979). Determinism views humans as products of a pre-determined environment, in which 'laws' govern behaviour. This perspective suggests that random events do not occur, but are linked by a chain of prior events. As such, free will is an illusion. Voluntarism treats humans as controllers of their own environment, and emphasises freedom of choice. This doctrine holds that individuals have the power over their own actions. The belief is seen as critical to many religions, because it implies that actions are not determined by omnipotent divinity, but by individual will or choice. Voluntarism implies that the mind has control over parts of the body within psychology. In ethics, it suggests that individuals are accountable for their actions. Whilst some argue that determinism and voluntarism are mutually exclusive, others suggest that the two assumptions of human nature are reconcilable. Whilst beliefs and desires may be determined by environment and social structures, 'freedom' relates to how individuals translate beliefs and desires into voluntary action.

4.1.4 Methodological Assumptions

Methodological assumptions are concerned with different approaches to inquiry and method selection. Burrell and Morgan (1979) argue that assumptions regarding ontology, epistemology and human nature determine methodological assumptions for research and coin two sets of assumptions *Rationalist* and *Ideographic*. Within the objectivist approach to research, rationalism looks for laws and generalisations. Important methodological issues are the measurement of concepts, identification of themes, with an emphasis on systematic protocol, and standardised instruments. Rationalism often uses *deductive reasoning*, testing pre-defined theory in an attempt to build on existing knowledge. A deductive approach may be suitable when a phenomenon is well defined and existing theory provides concepts and relationships that can then be tested empirically (Gill & Johnson, 1997). Common methods used are surveys, inventory studies, and demographic analyses, which provide data and allow statistical testing of relationships between clearly defined variables. The results of the research are intrinsically linked with the ability of tests to be replicated, verified and generalised (Byrman, 1988).

Within the subjectivist approach, methodological assumptions are ideographic. Here, the focus is on using first-hand knowledge to explain and understand what is unique and particular to an individual. Considerable emphasis is placed upon 'getting close' and exploring the detailed background of one's subject. The ideographic style follows the notion of *inductive reasoning*. This involves the collection of observations from cases, which may lead to the detection of patterns and regularities. Based on the researcher's own knowledge or experience, hypotheses can then be developed. These may lead to general conclusions or theories based on exploration and combined with the strength of previous observations. Inductive research may be appropriate if little is known about a phenomenon or when current perspectives seem inadequate because they have little empirical substantiation (Eisenhardt, 1989). The ideographic style tends to use participant observation, open-ended interviewing, or personal documents, to enable the researcher to see the world as the subject sees it.

Critical realism rejects the view that methodological assumptions are determined by ontological and epistemological standpoint (Bryman 1988, 1989; Donaldson, 1998,

Mingers, 2001). Methodologically it supports a *pluralist* approach and does not fully accept either purely positivist or purely anti-positivist research. Furthermore, it allows for the integration of quantitative and qualitative methods in research. Whilst critical realism accepts the existence of reality in line with realism, the use of deductive reasoning, through hypothesis testing, is rejected. Within the critical realist paradigm, the methodological instrumentation is *abductive reasoning*. Abduction involves developing hypotheses based on observations or perceptions of a phenomenon.

4.1.5 Assumptions along the Objectivist-Subjectivist Continuum

Table 10 provides a framework for positioning research in terms of meta-theoretical and methodological assumptions. The table shows how assumptions regarding ontology, epistemology, human nature and methodology tend to be aligned. However, as noted, these connections may be considered typical rather than deterministic (Bryman 1988, 1989; Donaldson, 1998, Mingers, 2001).

Table 10. Basic Assumptions along the Objectivist-Subjectivist Continuum

	⟷					
Ontological – reality as...	Concrete structure	Concrete process	Contextual field of information	Realm of symbiotic discourse	Social construction	Projection of human imagination
Epistemological	To construct a positivist science	To study structures, process, and change	To map contexts	To understand patterns of symbiotic discourse	To understand how social reality is created	To obtain insight and revelation
Human Nature	Man as responder	Man as adaptor	Man as Information processor	Man as actor, the symbol user	Man as social constructor, symbol creator	Man as pure spirit, conscious being
Methodological	Lab experiments, surveys	Case study, historical analysis	Contextual analysis of Gestalten	Symbiotic analysis	Action research	Exploration of pure subjectivity

4.2 Research Design & Methods Options

This section examines the choices available to the researcher in designing a study (Flynn *et al.* 1990; Gummesson, 1991; Yin, 1994; Sekaran, 2003). Firstly, options relating to the level of interference, the time horizon, and the researcher role are

reviewed. This is followed by a discussion of five research approaches – *experimental research, survey research, case study research, qualitative research,* and *action research.* Finally, choices concerning specific methods are explored, considering *participant observation, historical archive analysis, interviews,* and *questionnaires.*

4.2.1 Extent of Interference

The extent of research inference is largely determined by whether the investigation is *causal* or *correlational* (Seakaran, 2003). Studies seeking to establish cause-and-effect relationships require a high degree of interference, in order to study the impacts on dependent variables caused by the manipulation of independent variables. Causal studies may occur in a laboratory or a tightly controlled work environment. In contrast, correlational studies have much lower levels of interference and take place in the natural environment of the organisation.

4.2.2 Time Horizon

Research can either be *longitudinal* of *cross-sectional* (Sekaran, 2003). *L*ongitudinal studies allow the researcher to study phenomena over a period of time in order to answer research questions. Information may be collected from individuals a number of times, often before and after some kind of management intervention. For this reason, longitudinal studies are particularly useful for establishing cause-and-effect relationships and are often used in experimental research. Whilst longitudinal studies offer good insights, they do take much longer to complete and can be costly. By contrast, cross-sectional studies involve the collection of data over a single period of time. These 'one-shot' studies are most commonly used for field studies, due to the time, effort and costs involved in longitudinal work.

4.2.3 Research Setting

Research may be carried out in *contrived* or *non-contrived* settings (Sekaran, 2003). Laboratory experiments are often used in 'pure science' and involve assigning subjects at random to either an experimental or control group. The researcher then manipulates conditions for the experimental group to assess the impact in comparison to the control group. Because of the practical challenges facing lab experiments in

management research, field experiments have been widely employed in positivist research (Easterby-Smith *et al.* 1997). A popular approach to field experiments is the pre-test/post-test research design. Here, the effect of an intervention (e.g. a training course) is determined by comparing results of groups subjected to the intervention with a control group. However, field experiments are limited by the inability to control all variables and the fact that the control group often changes between measurements (Easterby-Smith *et al.* 1997; Sekaran, 2003). Finally, a field study involves research in a non-contrived setting, where work proceeds normally within each organisation, rather than being subjected to any form of manipulation.

4.2.4 Role of Researcher

The role of the researcher may be *action-based* or *investigative* (Gummesson, 1991). In action-based research, knowledge is generated through a cyclical process between action and reflection. Therefore, the researcher is active, as opposed to passive in their role. Clearly, this has implications for research bias as the researcher and the 'researched' as more closely entwined. It may be difficult to remain objective whilst being actively involved in the change process. An investigative researcher studies phenomena in a natural setting, but does not seek to make changes to how organisations or individuals operate. The key is to understand the phenomena from the perspective of the informant, rather than from the researcher's frame of reference. Whilst research bias remains a challenge for either role, the lack of direct involvement in change may make it easier to remain objective in an investigative role.

4.2.5 Experimental Research

Experimental research design is used when it is important to establish definitive cause-and-effect relationships (Sekaran, 2003). The researcher seeks to manipulate independent variables, control intervening variables, and systematically observe any changes that occur (Gill & Johnson, 1997). It may take place in a contrived environment (lab experiments) or a natural environment (field experiments). Lab experiments enable a high degree of control, but may lack generalisability in the 'real world'. Because field experiments take place in a non-contrived setting, they give a higher degree of external validity, but the lack of control can preclude conclusive

results. In most cases, there are multiple factors acting on an independent variable, and it is more important to identify factors *associated* with the problem, rather than establish cause-and-effect relationships (Sekaran, 2003).

4.2.6 Survey Research

Within the purchasing management literature, survey research is a popular research design (Babbar & Prasad, 1998). Based on rationalist methodological assumptions, the objective is usually to examine the relationship between variables through statistical analysis, using quantitative techniques (Flynn *et al.* 1990). Considerations for the design of survey research include access to subjects, data collection, analysis, and measurement. When the focus of the research is on statistical generalisation, survey research may be the most appropriate design. Whilst it is adequate for fact finding and useful for obtaining quantitative data, the lack of 'rich data' is a significant limitation of survey research (Dale, 1992). Where little prior knowledge exists and research is inductive, this design may be inappropriate (Yin, 1994).

4.2.7 Case Study Research

Case study research offers scope for in-depth study, with a strong emphasis on the context in which complex phenomena occur (Yin, 1994). The approach is particularly useful in answering 'how' and 'why' questions, in addition to exploratory 'what' questions. It is often used when the focus of study is on contemporary rather than historical events (Yin, 1994). Unlike experimental research, variables are not controlled or manipulated through interventions. Instead, outcomes and processes are measured using multiple data collection techniques, depending on the type of case research. Case studies may be used to test or develop theory, in single or multiple cases, using a mixture of quantitative and qualitative methods.

4.2.8 Qualitative Research

Although similar in nature to case study design, qualitative research uses only qualitative methods in exploring phenomena (Flynn *et al.* 1990). It usually takes a phenomenological perspective, with the researcher seeking to understand, report, and evaluate the meaning of events for individuals. As such, the focus is on the way in

which participants (rather than the researcher) interpret their experiences and construct social reality. The dominant methods of data collection are participant observation and interviews. Methodological assumptions are typically ideographic, with theory development usually based on qualitative data and interpretations of observations. The limitation of this research design is that the exclusion of quantitative methods makes it difficult to generalise results beyond individual cases.

4.2.9 Action Research

Action research is a reflective and experimental design which involves active intervention by the researcher, followed by close scrutiny of the effects (Flynn *et al.* 1990). Knowledge is generated through a cyclical process that alternates between action and critical reflection. Problems in the workplace are identified and remedies developed. Having implemented changes, observation enables revisions to plans, and further changes. The method is most appropriate when active intervention is sought and there is time to follow a number of 'actions cycles' is available.

4.2.10 Method Options

Four common methods of data collection were considered for the study (Flynn *et al.* 1990; Easterby-Smith *et al.* 1997). These were *participant observation, historical archive analysis, interviews,* and *questionnaires.*

Participant Observation

Participant observation has it roots in ethnographic research. Given that organisations can be viewed as 'tribes' with varied customs and practices, this method of data collection has also been applied to management research. Participant observers become part of the process being observed to allow them to record the experiences of individuals (Flynn *et al.* 1990). Easterby-Smith *et al.* (1997) suggest a schema of four researcher roles for participant observation; *researcher as employee, researcher as explicit role, interrupted involvement,* and *observation alone.* The schema essentially moves from high to low levels of research involvement. The choice of roles is largely determined by the purpose of the research, costs, access, and the availability of time.

Participant observational studies have the advantage of gaining data from events as they normally occur and allow the observer to record contextual information as it relates to events/outcomes (E.g. the weather, the day of the week, the time of day etc). However, there are also a number of drawbacks to observational studies. Firstly, participant observation requires the researcher to by *physically* present, often for prolonged periods of time. As a result, the collection of data through participant observation is often slow, tedious and expensive (Sekaran, 2003). Secondly, there is a high risk of researcher bias in observational studies. Data is prone to bias through recording errors, selective retention of information, observer fatigue, misinterpretation, and non-verbal clues. Finally, there is the potential for respondent bias. Individuals knowingly being observed are likely to behave differently during the study period (Flynn *et al.* 1990).

Historical Archive Analysis

Often used in conjunction with a single or multiple case study design, historical archive analysis involves the unobtrusive collection of documentary evidence relating to research questions (Flynn *et a;.* 1990). The term incorporates three of Yin's (1994) six sources of evidence – documentation, archival records, and physical artifacts. The advantage of archival data is that, because it has no awareness that it is being observed, it is unbiased (Flynn *et al.* 1990). However, the researcher has no control over the type of data gained through archival data. It is therefore often used in conjunction with other data collection methods.

Interviews

Flynn *et al.* (1990) review a number of methods available to the researcher which permit an organised approach to interviewing, without limiting the richness of data. In this way, interview methods involve more than simply talking to individuals and taking notes. In considering structure, Yin (1994) suggests a continuum between *open-ended* and *structured* interviews. In open-ended (unstructured) interviews, the researcher enters the interview setting with no pre-planed sequence of questions. Instead, the focus is on identifying preliminary issues for further investigation. A semi-structured interview may still remain open-ended, but questions are more focused on specific problems or issues. Structured interviews are more in keeping with a formal survey (Yin, 1994). Easterby-Smith *et al.* (1997) warn against the use of

'non-directive' interviews, stating that researchers are 'likely to be more successful if they are clear at the outset about the exact area of interest.' (p75).

Questionnaires

Yin (1994) states that interviews should only be considered *verbal reports*, which are subject to issues of bias, poor recall, and inaccurate articulation. Therefore, he argues that it is useful to corroborate interview data with information from other sources. Compared with highly qualitative data generated from interviews, questionnaires are relatively easy to analyse. However, the downside of this method is that it does not allow for a 'user narrative' in describing perceptions

4.3 Philosophical, Research Design & Methods Decisions

This section presents the decisions made for the study relating to philosophical position, research design and methods. A summary of these decisions can be found at the end of the section. Gill and Johnson (1997) argue that there is no best research approach, irrespective of context. The key is to design the research in a way that will be most effective for resolving a given problem.

4.3.1 Philosophical Decisions

Ontology

This study takes a realist perspective that objective reality does exist 'out there'. However, the existence of an external reality such as perceptions of *EPQ* does not mean that one is able to have direct knowledge of that reality. Richards (1983) notes that, 'if in studying nature, science inevitably affects the nature of what it studies, it must be that science after all only gives us the appearance of the world' (p75). Meredith *et al.* (1989) add that the mechanisms used in studying a phenomenon mould the researcher's perception of reality. As such, the way in which *Perceived EPQ* is measured will inevitably affect the view of 'reality' to a greater or lesser extent. Therefore, it is important to appreciate the impact of the researcher on what is known.

Epistemology

It is argued that a positivist stance is unsustainable because it ignores perceptions, values, context and socio-historical complexities of human behaviour. This study adopts a critical realist approach, which accepts that knowledge is socially and historically conditioned (Mingers, 2001). As such, one is aiming to understand social structures and interactions, rather than simply looking at the 'constant conjunctions' that result from them. The advantage of critical realism is that it allows some judgement without the need to state that things are 'true' throughout time and space (Donaldson, 1998). In this way, it represents a type of 'middle way' in research between the extremes of positivism and anti-positivism. Academics within operations management are increasingly adopting ideas and methods associated with critical realism as a way of combining the ontological strengths of realism with the epistemological value of both positivism and anti-positivism (Ellram & Carr, 1994).

Human Nature

The assumptions of human nature for this study fall between the extremes of determinism and voluntarism (Burell & Morgan, 1979). Whilst the researcher believes in some freedom of choice, it is clear that people are significantly influenced by their environment (See section 4.1.3). As such, voluntarism is strongly tempered by cultural factors (country, religion, profession, age etc) which affect the way people see, judge and do things.

Methodological Assumptions

The study supports a *pluralist* approach to methodology (Mingers, 2001), which does not fully accept either purely positivist or purely anti-positivist research. The use of abductive reasoning, under the philosophical foundations of critical realism, is seen as appropriate for the study of *Perceived EPQ*. The research is exploratory, rather than confirmatory, because little specific theory concerning *Perceived EPQ* exists in the antecedent literature. It is argued that a rationalist methodology, using deductive reasoning, does not capture the entirety of the phenomena under investigation. This is because the meta-theoretical assumptions for the study deviate from the extreme objectivist stance (Mingers, 2001).

4.3.2 Research Design Decisions

Level of Interference

The aim of this study is not to establish definitive cause-and-effect relationships, but rather to undertake a detailed exploratory study of the phenomenon. Correlational work allows the researcher to study *Perceived EPQ* in a natural setting, rather than in a tightly controlled work environment (Sekaran, 2003). As such, it is particularly appropriate when the boundaries between phenomena and context are unclear (Yin, 1994). There was minimal interference with the normal activities of case organisations beyond carrying out interviews and administering a questionnaire to e-procurement users.

Time Horizon

The choice between longitudinal and cross-sectional study is partly influenced by practicality and cost (Sekaran, 2003). A longitudinal study was impractical given the time constraints of the research. In addition, the fact that the study was not seeking to establish cause-and-effect relationships meant that longitudinal research was not essential. As a result, a cross sectional study was selected. This allowed a large amount of data to be collected over a single period of time.

Research Setting

The setting for the research is non-contrived, rather than contrived. As with the level of interference and time horizon, this is partly influenced the fact that the study does not seek to establish cause-and-effect relationships (Easterby-Smith *et al.* 1997; Sekaran, 2003). As such, a field study is seen as the most appropriate setting for the study, with work proceeding normally within each organisation, rather than being subjected to any form of manipulation.

Role of the Researcher

The role of the researcher is investigative as opposed to action-based. This was because the study did not seek active intervention, but rather the investigation of the phenomenon in its natural environment (Gummesson, 1991). A high level of objectivity was needed to minimise researcher bias and ensure that the perceptions of those involved in the phenomenon were gained effectively.

Choice of Design

An experimental approach is not deemed appropriate because the study does not seek to establish definitive cause-and-effect relationships (Sekaran, 2003). In addition, it is seen as important to explore *Perceived EPQ* in its natural setting and with no manipulation. A survey approach may be adequate for fact finding and obtaining quantitative data, but the lack of 'rich data' is a limitation (Dale, 1992). Given the fact that little prior knowledge exists in the area of *Perceived EPQ* and the study is exploratory, this design is rejected. A qualitative approach is not used because the exclusion of quantitative methods makes it difficult to generalise results beyond individual cases (Flynn *et al.* 1990). An action approach is rejected, because the research does not seek to make changes in the way e-procurement is delivered through intervention (Flynn *et al.* 1990).

A case study approach is selected, because it places a strong emphasis studying phenomena in their natural environment, and enables the researcher to ask exploratory 'what' questions, as well as 'how' and 'why' questions (Yin, 1994). Comprehensive understanding can be gained through the accumulation of different sources of evidence, known as *perceptual triangulation* (Bonoma, 1985). The main advantage of case study research is that theories are created directly from the data, based on the study of phenomena in their natural environment. Yin (1994) notes that case studies are particularly appropriate when the boundaries between phenomena and context are unclear. The broad case approach used in the study is examined in section 4.4, whilst specific methods are presented in sections 4.5, 4.6, and 4.7.

4.3.3 Research Method Decisions

Triangulation of Methods

The critical realist position adopted for this study suggests that the social reality constructed by e-procurement users is fallible. This is because it is based on individual perceptions rather than absolute facts. To compensate for the incomplete appreciation of reality, a number of authors advocate the use of triangulation (Jick, 1979; Abrahamson, 1983; Flynn *et al.* 1990; Miles & Huberman, 1994; Yin, 1994;

Easterby-Smith *et al.* 1997; Bryman, 2000; Mingers, 2001; Lim & Dubinsky, 2004). Flynn *et al.* (1990) argue that using a combination of data collection methods improves the researcher's judgemental accuracy. Bryman (2000) concurs, stating that reliable and valid results are more likely through the use of multiple measures for any given phenomena. One advantage of case study research is the ability to draw on several sources of evidence to answer research questions (Yin, 1994).

Some academics argue that selection of methods is determined by meta-theoretical assumptions (Burrell & Morgan, 1979). However, it is not clear that links between epistemological choice and data collection methods do, or should exist (Bryman 1988; 1989; Donaldson, 1998; Mingers, 2001). The view that quantitative techniques only belong in experimental or survey research, is highly doubtful. Frameworks used to determine method selection based on ontological and epistemological position are useful in clarifying the paradigmatic influences upon different methods. However, such frameworks often ignore the fact that a single method may be used in various ways and by researchers with very different philosophical positions.

This study combines both qualitative and quantitative methods in a multi-strategy approach described as *complementary* (Hammersley, 1996). No method is dominant, but is used in order that different aspects of the investigation can be dovetailed. The research initially adopts qualitative techniques to model *Perceived EPQ*. Subsequently, quantitative techniques are applied to explore the structure of *Perceived EPQ*, validate the proposed *EPQ Scale,* and to assess alternative construct operationalisations. Quantitative techniques are also used during replication work in a new setting. The selection of methods is now reviewed.

Participant Observation

Given the decision to undertake cross-sectional rather than longitudinal research, participant observation is not deemed an appropriate technique for the study (Sekarna, 2003). Within the research, the technique has not been applied beyond observation during e-procurement implementation meetings.

Historical Archive Analysis

Documentary evidence has been used in this research to support primary data collection (Flynn *et al.* 1990). Annual reports and publicity material, mission statements, strategic plans, and process flow charts have been examined to gain a better understanding of the structure and strategy of the case organisations. The access to documentation has been high in all cases. The researcher has been provided with confidential internal reports relating to e-procurement implementation and progress, minutes of meetings, any operational handbooks, and to all training material available.

Interviews

Interviews are an essential source of information in case study research (Yin, 1994) and have been used to explore *Perceived EPQ* during *Phase 1* and *2* of this study. The aim has been to understand the construct from an internal customer perspective, rather than from the researcher's own frame of reference (Easterby-Smith *et al.* 1997). Details of interview methods used in this study are presented in section 4.5, considering design, data collection, preparation, and analysis.

Questionnaires

Whilst questionnaires are most commonly used in survey research, they are also appropriate for use in case studies (Flynn *et al.* 1990). Yin (1994) states that interviews should only be considered *verbal reports*, which are subject to issues of bias, poor recall, and inaccurate articulation. Therefore, he argues that it is useful to corroborate interview data with information from other sources. Questionnaires have been used in *Phase 3* of the main study with the aim of exploring of validating the proposed *EPQ Scale* and examining the structure of *Perceived EPQ*. Details of questionnaire methods used in the study are presented in section 4.6, considering design, data collection, preparation, and analysis. Questionnaires have also been used in a replication study, with the aim of validating research findings in a new context (Yin, 1994). Replication study design and methods are presented in section 4.7.

Summary of Methods

Table 11 provides a summary of the methods used and how they relate to different stages of the study.

Table 11. Research Methods & Their Use in the Study

	Phase 1	***Phase 2***	***Phase 3***	***Replication 1***
1^A What are the components of Perceived EPQ?	Interview	Interview	Questionnaire	Questionnaire
1^B What is the structure of Perceived EPQ?	N/A	N/A	Questionnaire	Questionnaire
1^C What is the best method of scale calculation for Perceived EPQ?	N/A	N/A	Questionnaire	N/A
Detail of Methods	Section. 4.5		Section 4.6	Section 4.7
Empirical Analysis	Ch. 5		Ch. 6	Ch. 7

4.3.4 Review of Decisions

The study takes a critical realist position. At an ontological level, it is argues that objective reality does exist, but is moulded by research mechanisms. Epistemologically, knowledge is considered to be socially and historically conditioned, and therefore fallible to error. Concerning human nature, voluntarism is partial as a result of cultural influence (country, religion, profession, age etc). The study supports a pluralist approach to methodology, which does not fully accept either positivism or anti-positivism. The study is exploratory and uses abductive reasoning to develop theory based on perceptions of phenomena.

The level of interference has been minimal, because the aim is not to manipulate variables, but to examine the construct in a working environment. Partly due to time constraints, the study has been cross-sectional, whilst the setting is non-contrived. The researcher has taken an investigative role in the study. This was because the study does not seek any form of active intervention. A case study approach has been applied, because it places emphasis on studying phenomena in their natural environment where the boundaries between phenomena and context are unclear.

The case study approach provides the opportunity for examining phenomena using multiple sources of evidence. Documentary evidence has been useful in preliminary work. Subsequently, semi-structured interviews have been used to delineate *Perceived EPQ* from an internal customer perspective and develop a scale for its measurement. In refining the proposed *EPQ Scale*, additional interviews have been carried out. Questionnaire data has been collected to explore the structure of *Perceived EPQ*,

validate the proposed *EPQ Scale*, and assess alternative methods of scale calculation. Replication work has also used questionnaires to validate research findings in a Dutch e-procurement context. **Table 12** summarises the decisions made for the study relating to philosophical position, research design and methods.

Table 12. Philosophical, Research Design & Methods Decisions

Objectives	**1. Model *Perceived EPQ***	
Issues	**Decisions**	**Rationale / Comments**
Ontology	Realism	Research mechanisms mould the researcher's perception of reality
Epistemology	Critical Realism	Knowledge is socially and historically conditioned
Human nature	Determinism / Voluntarism	Freedom of choice limited by cultural factors
Methodology	Exploratory Pluralism	Abductive reasoning – theory development based on observations / perceptions, followed by testing (i.e. induction ➔ deduction)
Interference	Low	Correlational rather than causal
Time Horizon	Cross-Sectional	Time, effort, and costs of longitudinal work
Setting	Field Study	Non-contrived, no manipulation required
Researcher Role	Investigative	Not seeking intervention
Research Design	☒ Experimental ☒ Survey ☒ Qualitative ☒ Action Research ☑ Case Study	Not seeking to prove cases-and-effect relationships Not testing theory through deduction in 1st instance Only qualitative methods - limits external validity No active intervention in e-procurement delivery Theory building, in-depth study, emphasis on context Answer exploratory 'what' questions, as well as 'how' and 'why' questions
Methods	☒ Participant observation ☑ Historical Archives ☑ Interviews ☑ Questionnaires	None beyond observation in *EMI* & *LAUG* meetings Used to support primary data collection Delineating *Perceived EPQ* Developing *Perceived EPQ* measure - *EPQ Scale* Validating *EPQ Scale* Examining structure of *Perceived EPQ* Assessing calculation options for measurement scale Replication study

4.4 Case Study Research

In developing the case study approach, it is important to consider the type of case, number of cases, case selection, and the unit of analysis, (Yin, 1994). Each is discussed in turn.

4.4.1 Case Study Type

Yin (1994) distinguishes between three types of case study research – *exploratory, descriptive* and *explanatory*. The majority of case studies are exploratory because they are used to formulate more precise questions or generate testable hypotheses. Descriptive cases are often viewed as the least academic (Sen, 1980), because there are seen merely as observation and reporting. However, it is clear that description only occurs after a process of interpretation. Explanatory case research is used to examine cause-and-effect relationships. Gummeson (1991) argues that the three classifications are not mutually exclusive, stating that, 'exploratory studies as well as descriptions can be theory-generating, descriptions may be explanatory, and so forth' (p76). This research is largely aimed at theory building, so the case study approach may be classified as exploratory.

4.4.2 Number of Cases

Yin (1994) notes that some academics treat single-case studies and multiple-case studies as separate methodologies. However, the researcher supports his view that the two designs remain within the same methodological framework. Single case studies are often used when a case is unique (Eisenhardt, 1989b) or where it is crucial for testing a well-formulated theory (Voss *et al.* 2002). The key advantage is depth. A single case can allow the collection of data from a large number of individuals and a detailed study of processes, procedures, and documentation. In addition, it may allow for a longitudinal study, so phenomena can be observed over a period of time. However, single cases can yield limited generalisations and bias may exist in conclusions (Yin, 1994). Potential biases include misjudging how representative a single event is, exaggerating the salience of certain data, or biasing estimates because of unconscious anchoring (Leonard-Barton, 1990). Multiple cases offer a balance between in-depth study and increased external validity of conclusions (Voss *et al.* 2002). When replication of findings is required, multiple cases may be more appropriate than single cases. The study seeks to establish the components and structure of *Perceived EPQ* and develop a robust measurement scale for the construct. Whilst a single case would clearly provide rich data, it may inhibit generalising findings to other e-procurement contexts. In addition, the objective of the study is not

to examine a unique case or to falsify an existing theory (Yin, 1994). Rather, it is to develop understanding of *Perceived EPQ* in different e-procurement contexts. Given the research objectives, it is clear that a multiple-case approach is most appropriate for the study.

4.4.3 Case Selection

Miles and Huberman (1994) argue that qualitative samples are usually purposive rather than random. This is because the 'initial universe is more limited' and with a small number of cases, random sampling may create significant bias. There were a number of criteria for case selection in the study:

1. The case must have an e-procurement system in place
2. The case must have a 'typical' e-procurement system, in terms of transaction, volume, and system complexity
3. The case must have a minimum of around 50 e-procurement users
4. The case must allow access to managers and internal customers

In undertaking an in-depth investigation into *Perceived EPQ*, it is important to talk to individuals with direct experience of e-procurement. Therefore, any case selected needs to have an e-procurement system in place, ideally for more than six months. Because the study is largely exploratory, it is important to select typical rather than unique cases (Yin, 1994). Naturally, this has been a subjective decision, based on the researcher's experience of a wide range of e-procurement systems. Furthermore, to aid comparison between cases and identify patterns of behaviour, the system ideally needs to be common across settings. Given the planned use of quantitative as well as qualitative methods, it has been necessary to select cases with a sufficient number of active e-procurement users. Access has clearly been critical, especially as the researcher is most interested in the opinions of internal customers rather than service-providers.

For the main study in the U.K, contact with a number of potential leads was made through the Warwick E-Business (*WEB*) Forum. In August 2003, a meeting was held with Gary Richardson, the director of *IDeA Marketplace* – an e-procurement system

designed for use in the public sector. It was proposed that the researcher attend quarterly Local Authority User Group (*LAUG*) meetings and Essex Marketplace Implementation (*EMI*) meetings, to develop contacts with potential case organisations. Through the meetings and a series of discussions with procurement personnel, four cases were identified and access negotiated. These were *Essex County Council, Braintree District Council, Maldon District Council,* and *Tendring District Council.* All of these organisations use *IDeA Marketplace*, but the degree of implementation varies. In addition, *Basildon District Council, Rochford District Council,* and *Slough Borough Council* all agreed to help in pilot testing questionnaires and general brain-storming.

The IDeA Marketplace

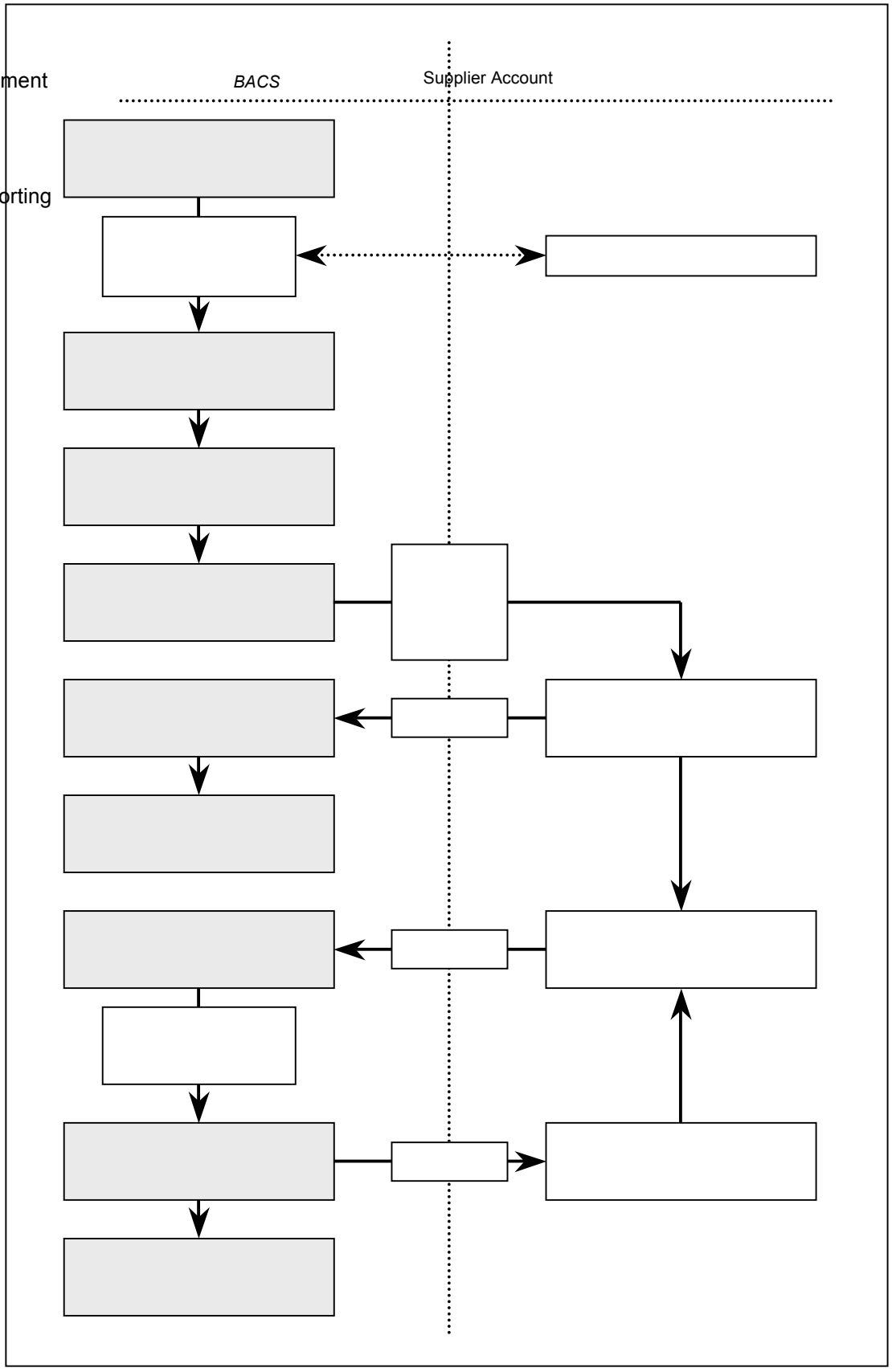
The *IDeA Marketplace* – hence referred to as *Marketplace* – was founded by the Improvement and Development Agency in 1999. It is a web-hosted e-procurement system and marketplace designed specifically for public sector organisations. Any organisation with access to the Internet can access *Marketplace.* This makes it a popular choice with small authorities, who are usually unable to justify the investment in 'stand-alone' e-procurement. There are currently 71 member organisations in the U.K. including district councils, county councils, city councils, and boroughs. The system has a number of areas of functionality, including e-ordering, e-invoicing, and reporting. **Figure 17** broadly demonstrates how the system functions.

The solution is designed to support all forms of procurement, not just catalogue items **(Figure 18).** It is worth noting, that given the focus of the study, most attention is given to catalogue consumables, indirect services, and periodic purchases. The majority of bespoke capital and bespoke indirect procurement is carried out by the purchasing department, rather than individual users.

Marketplace facilitates the collaboration of regional authorities in both procurement process and strategy. By pooling certain resources, significant transaction and price savings are possible. For example, shared application infrastructure reduces individual implementation costs. Whilst providing a common platform for procurement, a degree

- Requisition
- Receipt
- Invoice

Figure 17. *Marketplace* Functionality



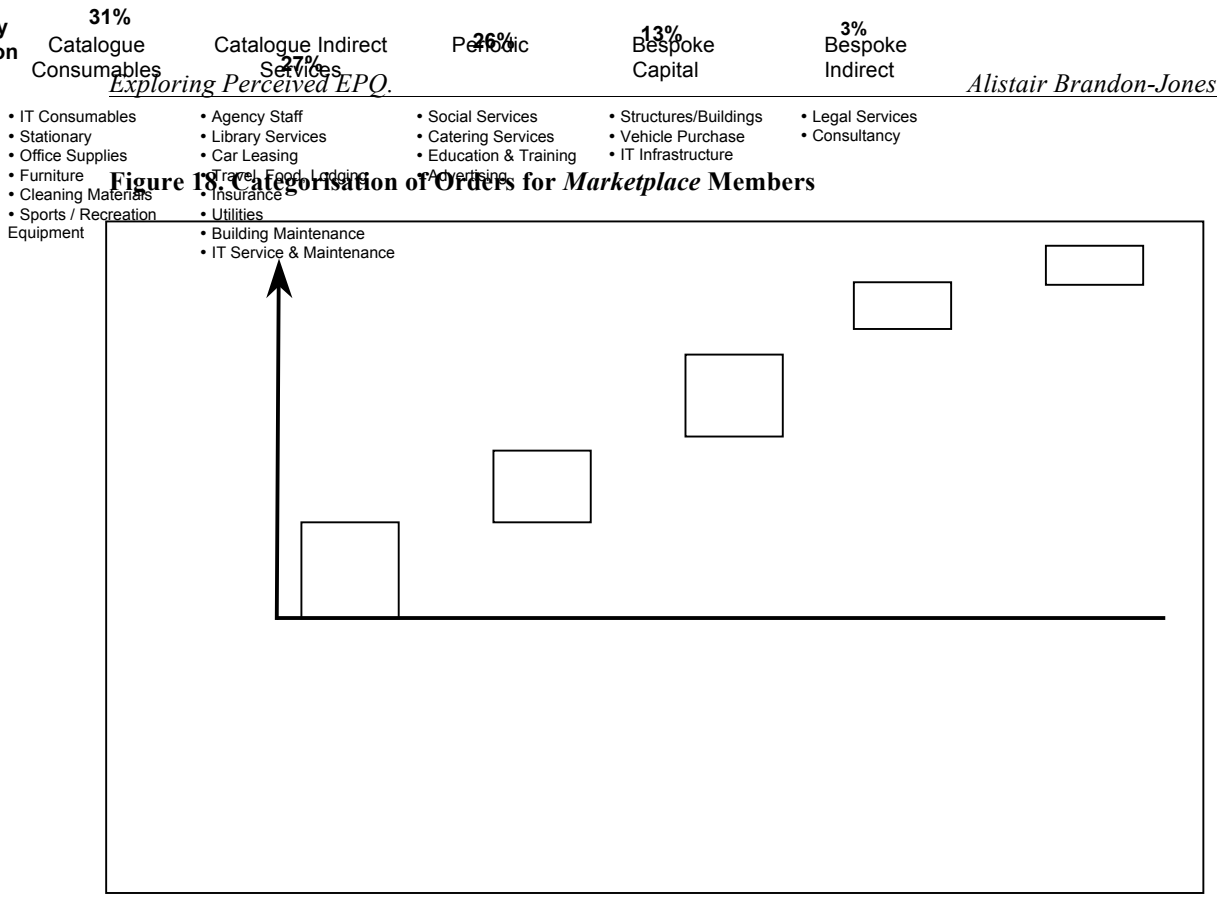


Figure 18. Categorisation of Orders for *Marketplace* Members

of customisation is also possible. The formatting of purchase orders, account code structures, and approval workflow all differ between cases. In addition, shared product catalogues allow organisations to share in strategic procurement contracts. Authorities can use combinations of existing suppliers and contracts from within *Marketplace.* Each organisation can choose which contracts to make available to e-procurement users. By encouraging organisations to share their existing and future catalogues, *Marketplace* members are able to leverage their own inherent specialisations in procurement through devolved negotiation.

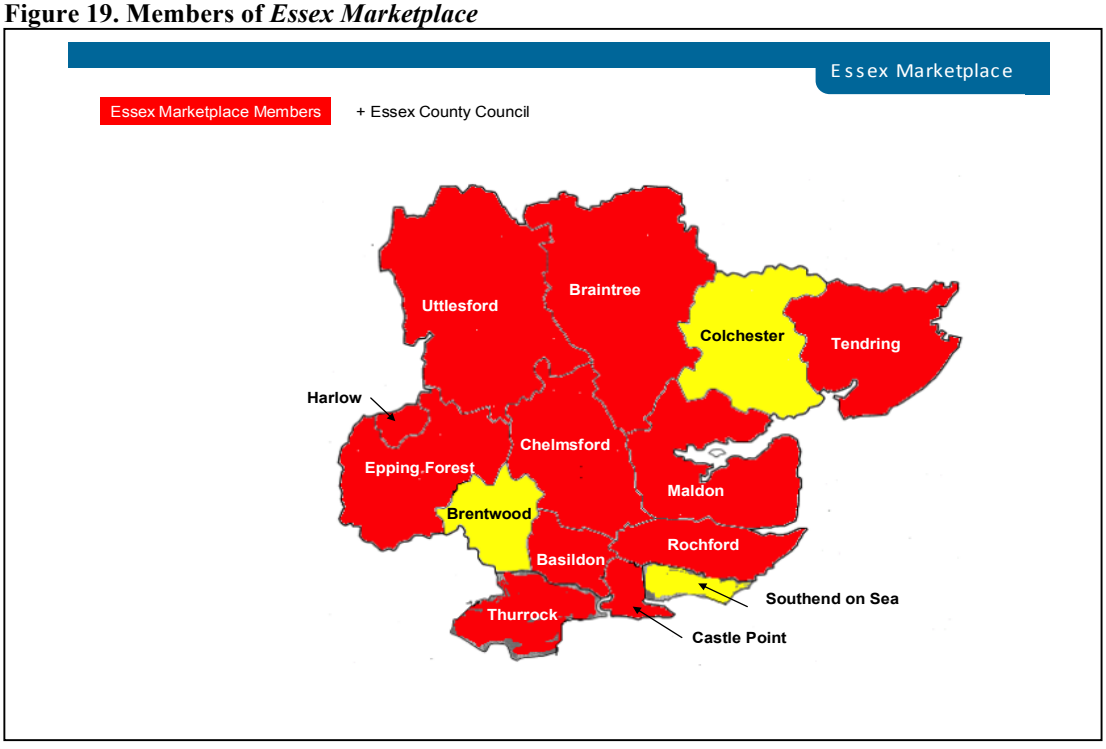
Marketplace also allows high levels of budgetary control. However, this does require work in integrating legacy financial management systems with e-procurement. Individuals can monitor purchasing activity through a variety of standard purchasing reports in addition to customised reports. Real time reports are generated from the *Marketplace* internal data warehouse. This allows individuals to remain informed of their own spending, whilst more senior users can also generate reports by group, department, account, product type, or supplier. Finally, suppliers can choose their preferred method of receipt, ensuring that non-internet enable suppliers are not disadvantaged. For sophisticated suppliers, *XML*-based transactional PO's and invoice integration is possible. Other suppliers can receive orders via e-mail or automated fax.

The system, hosted by E-Government Solutions (*EGS*), has a number of 'clone systems' across industries. Working with the Police e-Procurement Strategy Project Board, *EGS* are rolling out the *Bluelight* system with constabularies in Wales and the South West of England. They are also developing *Feonline.net* for U.K. further education colleges in partnership with the Association of Colleges. Similar e-procurement systems are also used in the U.S. Navy, U.S. Air Force, Citibank, State of South California, and N.A.S.A.

Essex Marketplace

There are a number of regional marketplaces within the broad umbrella of *Marketplace.* These groups are particularly focused on collaboration with other authorities within regions or shires. *Essex Marketplace* was one of the first local authority initiatives of this type. Led by *Essex County Council*, it is used by nearly all the district councils in Essex **(Figure 19)**.

Figure 19. Members of *Essex Marketplace*



Essex County Council is based in Chelmsford and is responsible for county-wide procurement in areas such as schools, highways and transportation, and social services. The council also purchases a wide variety of typical goods and services

which are common to itself and the districts. In line with U.K. government targets, the main aim of those involved was to be trading electronically with all suppliers by the end of 2005. Additionally, the group are looking to streamline procurement processes, and to e-enable local suppliers, so that they might benefit more fully from e-business. At the point of first contact (September 2004), *Essex CC, Braintree DC, Maldon DC* and *Tendring DC* had made the most progress in implementing e-procurement. Therefore, these four cases were seen as appropriate for exploring *Perceived EPQ.* **Table 13** provides summary information of the four cases.

Table 13. General Characteristics of U.K. Cases (Sep 04)

	Essex CC	Braintree DC	Maldon DC	Tendring DC
Number of employees (FTE)	26,500	800	200	450
Yearly Budget (Total)	£1.6 billion	£45 million	£18 million	£40 million
Yearly Budget (G&S)	£600 million	£16 million	£6 million	£15 million
Requisitions P/A	150,000	4000	2000	2900
Active Suppliers	13,000	2500	800	2300
Previous Procurement System	Mix	Mix	Paper	Paper
***Marketplace* Start Data**	Jan 03	Dec 03	Aug 03	Oct 03
Project Team	Procurement	Procurement	Finance	Procurement
Roll-out Strategy	Commodity	Department	Department	Commodity
***Marketplace* Users**	156	44	41	54
Departments using *Marketplace*	13 of 15	8 of 9	4 of 4	11 of 11
Level of *FMS* Integration	Extensive	Limited	None	Limited
Use of Reporting Functionality	High	High	Low	Medium

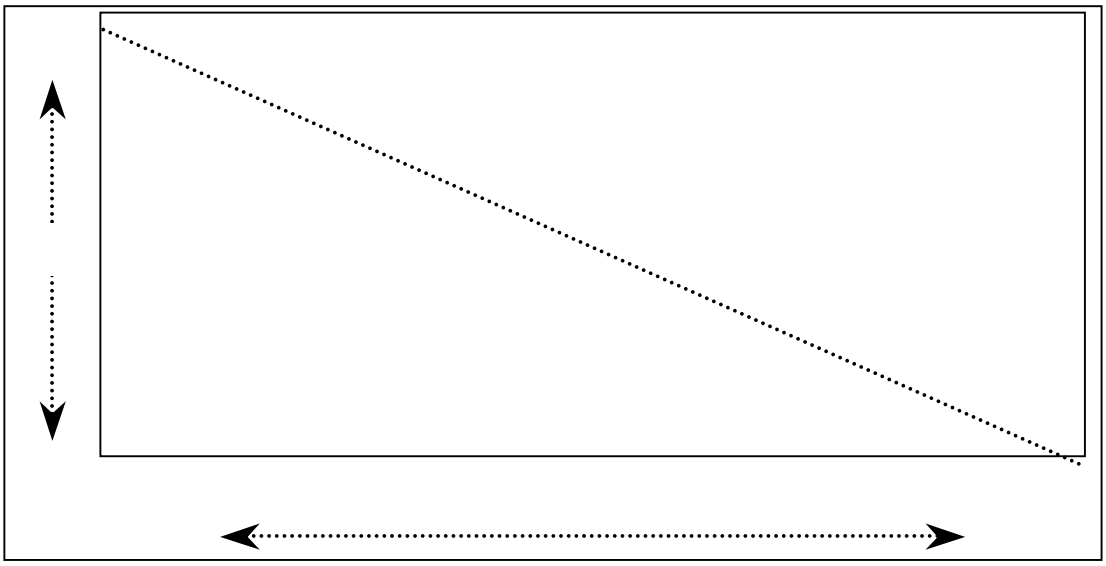
Replication Study

The main objective of the replication phase is to assess how well the findings from the U.K. study stand up in a new e-procurement environment and suggesting any areas for improvement. Access to Eindhoven University of Technology was arranged through Associate Professor Erik Van Raaij. The university's e-procurement system is web-based, with around 350 users. Procurement activity includes office stationary, catering and printing services, computer consumables, industrial gases, and chemicals.

Summary of Cases Selected

The cases were selected with the intention of covering a broad range of size, budget, implementation strategy, level of integration, and e-procurement activities. This was to ensure a good level of generalisation beyond particular organisational contexts. As such, the number of cases was determined by the point of *theoretical saturation* (Eisenhardt, 1989b). The replication was carried out in Holland in order to assess whether significant national differences existed in the definition of *Perceived EPQ.* Considering volume and variety characteristics (Slack *et al.* 2001), the five cases procure a wide variety of goods and services **(Figure 20).**

Figure 20. Volume-Variety Dimensions of Products/Service Exchanged in Cases



4.4.4 Level of Analysis

Within this study, the level of analysis is at across-case for the original U.K study. This is because the study's objectives are to explore *Perceived EPQ* and develop a measurement tool for future use. The use of aggregated data, with no differentiation between the cases or users surveyed, is a common practice in initial scale development work (cf. Parasuraman *et al.* 1988). However, by collecting data in 4 separate organisations during *Phase 1-3*, it is possible to use disaggregated data for within-case analysis in future research. Analysis of the replication study data was within-case, given the fact that a single organisation was used. However, analysis also involved comparison of results between the U.K. and Dutch data sets.

4.4.5 Conclusion on Case Study Approach

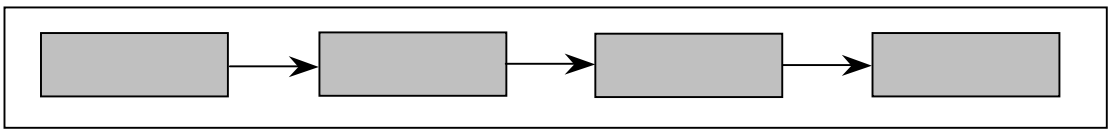
This section has reviewed the how the case approach is applied. **Table 14** summarises the decisions made relating to case study approach. Because the case is predominantly aimed as theory building, it is described as exploratory (Yin, 1994). Given the emphasis on typical rather than unique cases of e-procurement, a multiple-case design has been adopted for the study (Yin, 1994). The study uses a theoretical sample of organisations ranging in size, budget, and procurement activity. The high level of access granted by the four organisations in the U.K. and the one organisation in Holland has been important in modelling *Perceived EPQ* effectively.

Table 14 Case Study Approach Decisions

Objectives		**1. Delineate *Perceived EPQ*** **2. Develop & validate measure of *Perceived EPQ*** ***3.* Examine structure of *Perceived EPQ*** **4. Assess calculation options for the measure of *Perceived EPQ***	
Issues		**Decisions**	**Rationale / Comments**
Case Study Approach	Type of case	Exploratory	Predominantly theory-building
	Case Selection	4 Cases U.K. 1 Case Holland	Theoretical sampling, based on selection criteria
	Number of Cases	Multiple-Case	Increased generalisation through 'typical' cases, rather than single 'unique' cases
	Level of Analysis	Cross-case	Development of *Perceived EPQ* measure

The next three sections detail methods used in the study. Section 4.5 examines interview methods, applied in *Phases 1* and *2*. In combination, these two phases are used to delineate *Perceived EPQ* and develop a measurement scale for the construct – the *EPQ Scale.* Section 4.6 examines questionnaire methods used in *Phase 3.* This work focuses on examining the structure of *Perceived EPQ*, validating the proposed *EPQ Scale*, and assessing scale calculation options. Section 4.7 reviews the questionnaire methods used in the *Replication Study.* All three sections follow the process laid out in **figure 21**. They begin by discussing options for design and move on to explain how data has been collected, prepared and analysed.

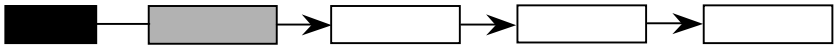
Figure 21. 4-Step Research Process



4.5 Research Methods – Phase 1 & 2

This section examines the methods used in *Phase 1* and *2* of the study. Related data analysis is presented in chapter five. These phases have two main objectives – to delineate *Perceived EPQ* and to develop a measurement scale for the construct. Yin (1994) notes the value of interviews as a source of information in case research. Given the exploratory nature of the study and the importance of the internal customer viewpoint in delineating *Perceived EPQ*, interviews are seen as the most appropriate method of data collection in the first instance. The section begins by discussing options for interview design and is followed by explaining how data was collected, prepared and analysed.

4.5.1 Phase 1 & 2 Interview Design



There are three important issues to consider in designing interviews. These are the degree of structure, bias avoidance, and the use of recording (Flynn *et al.* 1990; Yin, l994; Easterby-Simth *et al.* 1997).

Degree of Structure

Interviews exist along a continuum between *open-ended* and *structured* (Yin, 1994). The merits of the two extremes have been examined already (See section 4.2.10). Based on concerns with a 'non-directive' approach (cf. Easterby-Smith *et al.* 1997), semi-structured interviews were deemed most appropriate for the study. This was to ensure consistency across the interviews, whilst still giving respondents the opportunity to provide their own narrative on *Perceived EPQ.*

Bias Avoidance

Gummesson (1991) argues that unless active intervention is sought, the research may take an investigative role. This has been the approach adopted for the study (See sections 4.3.2 and 4.2.4). Whilst it is impossible to guarantee absolute impartiality, every effort was made to maintain neutrality during the interview process. *Response bias* is difficult to avoid, especially as the topic under discussion was sensitive to some. In fact, it was surprising how candid interviewees were. There was an

opportunity to talk informally after interviews and to cross-check information with other e-procurement users, service providers, and from knowledge gained during monthly *EMI* meetings. *Interviewer bias* may occur when the researcher imposes his or her frame of reference on the interviewee, when questioning and interpreting answers (Easterby-Smith *et al.* 1997). To avoid 'leading' respondents, an interview guide was used to lead discussions. This guide was carefully considered with a number of academics to ensure questions did not elicit socially desirable answers.

Taping and Transcription

Flynn *et al.* (1990) support the use of taping and transcription to ensure consistent and complete data. Taping reduces the need for detailed note-taking and allows the researcher to focus on the interview process itself (i.e. listening, questioning, and probing). Whilst taping can create a sense of anxiety with interviewees, Flynn *et al.* (1990) argue that most respondents do not object to being recorded. This view was bourn out during the study. Transcription of interviews has the further benefit of allowing other researchers access to the original data on which the *Perceived EPQ* construct is largely based. Therefore, with the permission of individuals, all interviews were taped and transcribed verbatim.

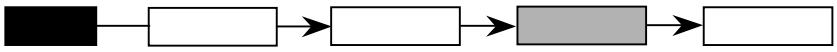
4.5.2 Phase 1 Data Collection

The main aim of *Phase 1* interviews is to develop an understanding of *Perceived EPQ*, as seen by internal customers. This ensures that construct variables are not pre-defined by the researcher, but empirically grounded within the respondents' frame of reference. *Phase 1* interviews were carried out with 20 system users and 3 service providers at *Essex County Council* **(Appendix 1).** The need to conduct in-depth interviews naturally constrained the number of interviews that was possible. At this point of the research, depth was seen as more important than breadth. The key was not to ensure statistical representation of all e-procurement users, but rather to gain detailed insight into *Perceived EPQ* (cf. Yin, 1994).

The interview guide used in *Phase 1* can be found in **Appendix 2.** Interviews began with the researcher introducing himself and discussing the broad aims of the research. Having assured interviewees of confidentiality, agreement to record was sought. Individuals were then asked to discuss the best and worst aspects of e-procurement delivery, and suggest any recommendations for improvements. In addition, the extent of both system and contract compliance was discussed.

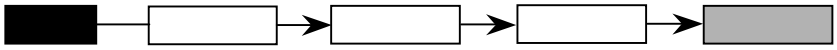
Interviews varied in duration from 45 minutes to nearly 2 hours. In some cases, discussions after the interview had officially finished provided additional insights into e-procurement delivery, so were added to the recording. Finally, it was important to thank respondents for their involvement in the research and give them an opportunity to comment further on topics raised. Therefore, in addition to a thank you card, an interview summary and transcript was sent to each interviewee. No changes to the transcripts were requested.

4.5.3 Phase 1 Preparation for Analysis



Before analysis, transcribed interviews have been coded based on three sources. Firstly, the provisional 'start list' of codes derived from the literature review (Table 9, Chapter 3). Secondly, key variables noted during all interviews. Thirdly, post-interview contact summary sheets, written up in the evenings following interviews **(Appendix 3).** A thorough review of transcribed interviews was then carried out to identify any new codes. Whilst having a provisional start list of codes is essentially deductive, these are modified based on inductive work. Miles and Huberman (1994) note that codes based on a more 'grounded approach' can ensure that the 'analyst is more open-minded and context-sensitive' (p58), rather than force-fitting the data into pre-existing codes. By keeping words and associate variables together throughout the analysis, one is able to maintain the 'essential characteristics' of each variable and ensure that they remained intelligible, rather than simply 'chunks of data'. An example of a coded transcript can be found in **Appendix 4.** All coded comments have been entered onto an excel spreadsheet under variable headings.

4.5.4 Phase 1 Analysis



The aim of this analysis is to delineate *Perceived EPQ* based on *Phase 1* interview transcripts. Initial coding used a process known as *open coding* (Glaser & Strauss, 1967) which essentially 'describes' the *Perceived EPQ* construct as seen by e-procurement users. Whilst the high level of detail gained through this approach is useful in the first instance, one of the aims of the research is to develop a measure of *Perceived EPQ*. Therefore, *axial coding* has been used to group codes with similar characteristics into broader categories whilst retaining their original meaning (Glaser & Strauss, 1967; Lowe & Glaser, 1995).

For each interview transcript, open codes have been written on coloured 'post-it' notes. These notes contain the name of interviewee, a code heading and any additional notes for clarification. In addition, the 72 potential variables, identified in the literature review, have been added to the code boards. Different colour post-it notes have been used to aid axial coding. Given the pre-eminence their views, internal customer codes are written on dark pink notes. Service provider codes are light pink, whilst literature codes are light yellow **(Figure 22).**

The coding process is an iterative one with several rounds of sorting lasting three days, before a set of *Perceived EPQ* axial codes are determined. Using this manual approach to axial coding helps retain the 'big picture' in mind and aids the constant comparison of open codes (Glaser & Strauss, 1967). In addition, it is possible to explore how codes of core variables relate to the literature.

4.5.5 Phase 2 Data Collection

The main objective of *Phase 2* is to refine the proposed components of *Perceived EPQ* and through this, propose a measure of the construct – the *EPQ Scale.* **Appendix 5** provides details of *Phase 2* interviews, carried out with 35 e-procurement

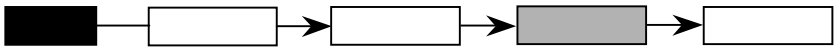
Figure 22. Axial Coding Boards

users in *Tendring District Council (TDC), Maldon District Council (MDC),* and *Braintree District Council (BDC)*. The interview guide in *Phase 2* is shown in **Appendix 6.** Having introduced the aims of the research, assured confidentiality, and gained agreement to record, interviewees were asked questions regarding e-procurement delivery, based on a 1-7 scale: *'well below my expectations'* to *'well*

above my expectations'. These questions relate to *EPQ* variables derived from axial coding in *Phase 1* analysis. In addition, there was a single question relating to the overall quality of e-procurement delivery *(OEPQ Rating*) anchored on the same scale. Having a separate and independent measure of a construct enables an assessment of the measurement quality of any proposed measurement scale. This approach is commonly used in scale validation (cf. Parasuraman *et al.* 1988; Pitt *et al.* 1995).

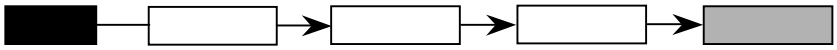
Respondents were encouraged to explain *why* they gave the ratings they did and asked to identify any elements of *Perceived EPQ* that had not been addressed by questions in the interview. Finally, information regarding e-procurement compliance was sought. System compliance was measured by the percentage of orders placed within an e-procurement system. Contract compliance was measured by the percentage of orders that are placed using an approved contract via an e-catalogue. Interviews lasted between 45 and 90 minutes. As with *Phase 1*, full interview transcripts were sent with a thank you card to all respondents.

4.5.6 Phase 2 Preparation for Analysis



Prior to analysis, transcribed interviews have been coded based on *Phase 1* axial codes. This is to help identify any new components of *Perceived EPQ* not delineated during *Phase 1* and to identify any codes that need re-specification. Descriptive data has been entered into *SPSS* version 13.0.1 to facilitate analysis. This enables the researcher to make an initial assessment of likely validity of the proposed *EPQ* components.

4.5.7 Phase 2 Analysis



The aim of *Phase 2* analysis is to refine axial codes, to initially validate selective *EPQ* codes, and to propose a measure of *Perceived EPQ*. Having coded transcripts from *Phase 2* interviews it is possible to go back to axial code boards and make further refinements – a process described by Glaser and Strauss (1967) as *selective coding.* Thus, in generating a final set of *EPQ* variables, the researcher moves from potential

codes based on the literature, through a process of open coding, axial coding and selective coding (Section 5.1). Selective codes have been reviewed by e-procurement experts in four meetings **(Table 15).** These reviews incorporated users, procurement managers, solution providers, and academics.

Table 15. *Perceived EPQ* Cluster Review Group

Name	Role	Organisation
Anna Hook	*Marketplace* User	*Essex County Council*
Ben Gamblin	*Marketplace* User	*Essex County Council*
Peter Clauss	*Marketplace* User	*Basildon District Council*
Charles Thomas	*Marketplace User*	*Basildon District Council*
Taya Coughlin	*Marketplace* Implementation Supervisor	*Slough Borough Council*
Stephanie Bickerdike	*Marketplace* Implementation Supervisor	*Essex County Council*
Adrian Gibson	Head of Procurement	*Essex County Council*
Gary Richardson	Director	*IDeA Marketplace*
Russell Charlesworth	Director	*E-Government Solutions*
Simon Croom	Senior Lecturer	*Warwick Business School*
Hilary Bates	Senior Research Fellow	*Warwick Business School*

A set of *Perceived EPQ* components is defined by the final group of selective codes (Section 5.2 and 5.3). These are tested in *SPSS* version 13.0.1 using descriptive data from *Phase 2* interviews. Validation involves the use of scatter plots, correlation coefficients, and regression analysis (Section 5.4). Whilst the small sample means that data should not be considered statistically reliable, these techniques allow the researcher to make an initial assessment of how well the components measure *Perceived EPQ.* A construct measure – the *EPQ Scale* – based on the validated components, is proposed at the end of chapter five.

4.5.8 Conclusion on Phase 1 & 2 Interview Methods

Table 16 summarises the decisions main in relation to interview methods. *Phase 1* and *2* of the study is concerned with delineating *Perceived EPQ* and developing a measurement scale for the construct. The use of semi-structured interviews gives a degree of structure and consistency, whilst providing the opportunity for individual narrative. Taping of interviews allows the researcher to focus on the interview process and to probe for further information where appropriate. Whilst transcription of around 70 hours of interviews was an arduous task, it ensures that no important variables have been ignored in *EPQ Scale* development. Using variables from different sources

(literature, interview notes, and contact summary sheets) has proved valuable during the coding process. It helps to ensure a balance between antecedent literature and empirical data in delineating *Perceived EPQ*. Having numbers as well as words in *Phase 2* interviews allows an assessment of how effectively components measure *Perceived EPQ*. The results of data analysis from *Phase 1* and *2* interviews are provided in chapter five. The next section describes the methods used in *Phase 3* of the study, which seeks to examine the structure of *Perceived EPQ*, to validate the proposed *EPQ Scale*, and assess alternative methods of scale calculation.

Table 16. Interview Method Decisions (*Phase 1& Phase 2*)

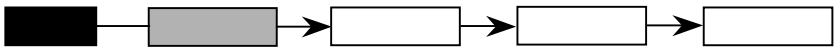
Objectives		**1. Delineate *Perceived EPQ*** **2. Develop measure of *Perceived EPQ* – the *EPQ Scale***	
Issues		**Decisions**	**Rationale / Comments**
Phase 1 & 2	Design	Semi-structured Investigative Interviewer Recording & transcription	Use of interview guide Minimise response bias: informal talks / cross-check Minimise interviewer bias: non-leading questions Focus on listening, questioning and probing Creates chain of evidence
	Collection	Duration: 45-120 minutes Interviews: 58 Profile: internal customers	In-depth insight rather than statistical representation Additional informal interviews prior to *P1* & *P2* Additional preliminary work with service providers
	Preparation	Transcription Coding *P2* Data onto *SPSS*	70 hours of interview, total 324,000 words 3 sources: literature list, interview notes, contact summary sheets Initial *EPQ Scale* testing
	Analysis	*P1*: Axial Coding *P2*: Selective Coding Scatter plots Correlation Regression analysis	83 open codes to 29 axial codes 29 axial codes to 33 selective codes Initial *EPQ Scale* Testing

4.6 Research Methods – Phase 3

This section examines the methods used in *Phase 3* of the study. This phase has three main objectives – to examine the structure of *Perceived EPQ*, to validate the proposed *EPQ Scale*, and to assess alternative ways to operationalise the construct. Yin (1994) notes that interviews should only be considered verbal reports, which are subject to bias, poor recall, and inaccurate articulation (See section 4.2.10 and 4.3.3). Therefore, it is useful to corroborate evidence through data triangulation (cf. Jick, 1979; Flynn *et*

al. 1990; Miles & Huberman, 1994; Yin, 1994; Easterby-Smith *et al.* 1997; Bryman, 2000; Mingers, 2001). Having applied interview methods to delineated *Perceived EPQ*, questionnaire data is used to examine the construct's structure, validate the *EPQ Scale*, and assess calculation options. The section starts by addressing questionnaire design and is followed by a review of how data was collected, prepared and analysed.

4.6.1 Phase 3 Questionnaire Design



There are three important issues to consider when design a questionnaire – sample selection, scale development, and pilot testing (Flynn *et al.* 1990; Easterby-Smith *et al.* 1997; Gilbert, 2000; Sekaran, 2003).

Sample Selection

Population refers to the members of a group under investigation by the researcher (Sekaran, 2003). Gilbert (2000) argues that there are significant differences between the self-reported ratings of focal groups and ratings of their internal customers. Self-rating bias and perceptual distortion bring into question the validity of assessing *EPQ* purely on perceptions of the service provider. Therefore, within this study, the population is defined as all internal customers of e-procurement across the four case organisations. The population frame from which a sample may be drawn is a list of all elements of the population – a register of *Marketplace* users at *Essex County Council, Tendring District Council, Maldon District Council,* and *Braintree District Council.*

Normally a sample is a subset of the population. However, Easterby-Smith *et al.* (1997) argue that where the population is small (<500), it may be best to distribute questionnaires to the entire group under investigation. There were 295 e-procurement users within the four cases, so a 'census' (100% sample) was applied. Because the study is exploratory, it is not appropriate to survey a broader set of e-procurement users across a range of settings, until the proposed *EPQ Scale* has been validated in its original research setting (cf. Parasuraman *et al.* 1988; Reynoso & Moores, 1995; Finn *et al.* 1996).

Scale Development

Flynn *et al.* (1991) note the inverse relationship between questionnaire length and response rate. Therefore, the questionnaire was kept as short as possible, whilst eliciting adequate information for scale validation. With one exception, closed questions were used throughout. This makes completion easier and aids subsequent data analysis. Sekaran (2003) notes the importance of approximating the level of respondents' understanding with the language of the questionnaire. Therefore, wording of all statements tried to use every-day language to capture the essence of each variable included in the survey. During questionnaire design, every effort was made to avoid questions that are double-barrelled, ambiguous, loaded, required distant recall, or prone to socially desirable answers (cf. Flynn *et al.* 1991; Easterby-Smith *et al.* 1997; Sekaran, 2003).

In line with Churchill (1979), a number of academics support the mixture of positive and negative statements in questionnaires. However, as discussed in the literature review, mixed wording in scales often causes confusion among respondents (Watson and Johnson-Laird, 1972) and may create method factors (Babakus & Boller, 1992). This study supports Carman's (1990) contention that, 'the disadvantages of including reversed items probably outweigh the advantages.' (p42). Therefore, all statements in the questionnaire are worded positively worded.

The core of the questionnaire is the 33 paired-statements for the proposed *EPQ Scale.* The pairing approach reflects the theoretical underpinning of *Perceived EPQ* discussed in the literature review (See section 2.2). Each pair relates to a single selective code identified during *Phase 1* and *2*. Both expectations and perceptions sections used 1-7 Likert scales from *'Strongly Disagree'* to *'Strongly Agree'*. At the end of section B, there is a single question relating to the overall quality of e-procurement delivery *(OEPQ Rating*). This is anchored on a 1-7 Likert scale from *'Very Poor'* to *'Excellent'*. Having a separate and independent measure of *Perceived EPQ* enabled an assessment of how well the proposed *EPQ Scale* measures the construct. This approach is commonly used in scale validation (cf. Parasuraman *et al.* 1988; Pitt *et al.* 1995). Section C seeks personal information and usage statistics, including system and contract compliance. Questions seeking potentially 'sensitive' information are placed at the end, because respondents were more likely provide such

information once they were convinced of the legitimacy of prior questions posed (Sekaran, 2003). Finally, an open question encouraging additional comments and a note of thanks is included at the end of the questionnaire.

Pilot Testing

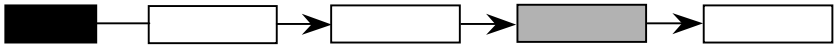
Pilot testing is an important element of questionnaire design in providing feedback on clarity, ease of completion, and assumptions of respondent knowledge (Sekaran, 2003). Initially, academic colleagues with considerable experience of questionnaire design were asked for feedback on the survey questions, structure and format. Subsequently, 18 e-procurement users from *Basildon District Council, Rochford District Council,* and *Slough Borough Council* were sent the proposed questionnaire. A convenience sample of typical respondents is considered acceptable for this stage of questionnaire development (Flynn *et al.* 1990). Feedback helped to further refine question wording, though no major changes were required. The final version of the *Perceived EPQ* questionnaire can be found in **Appendix 7.**

4.6.2 Phase 3 Data Collection

Sekaran (2003) argues that a 30% response rate is considered acceptable for mail questionnaires, whilst Flynn *et al.* (1990) note that studies within operations management have been published with rates as low as 10%. However, given the relatively small initial sample (295), it was important to ensure a much higher response rate than is typical for survey work. Whilst personally administered questionnaires can lead to a higher response rate (cf. Cox *et al.* 2005), this option was not possible due to the sample size and geographical spread of potential respondents. Another option is to personally contact potential respondents prior to questionnaire distribution (Flynn *et al.* 1991). This can help in gaining commitment to the study and reassuring individuals of anonymity. In agreement with the four case organisations, the researcher obtained contact details for all potential respondents. Contact was made with 284 individuals, with all but 3 agreeing to complete the questionnaire. These were sent a questionnaire and a covering letter thanking them for agreeing to take part in the study **(Appendix 8).** The 11 individuals who could not be contacted were also sent a questionnaire, but with a slightly modified covering letter requesting their

participation. All questionnaires included a pre-paid post envelope to encourage a high response. Of the original 295 e-procurement users, 274 returned usable questionnaires, representing an overall response rate of 92.9%. The demographic information of the respondents is provided in **Appendix 9.**

4.6.3 Phase 3 Preparation for Analysis



To enable analysis of questionnaires, all data has been entered in *SPSS* version 13.01. The data set has been examined by a second researcher to ensure that no mistakes have been made during input. In line with Hair *et al.* (1998), every tenth line has been carefully checked against original questionnaire – no errors have been identified. Hair *et al.* (1998) also suggest a number of tests that should be carried out prior to multivariate analysis. These include examination of non-response bias, missing data, outliers, linearity, multivariate normality, and variable correlations.

If those who do not respond to questionnaires are significantly different from those that do, the validity of results can be questioned (Flynn *et al.* 1991). T-tests are carried out comparing the means of *EPQ* variables for early and late respondents (cf. Jiang *et al.* 2002). This test indicates if the views of respondents and non-respondents are significantly different. Missing data creates the potential for hidden bias and impacts on the practical sample size for subsequent multivariate analysis (Hair *et al.* 1998). It is important to examine the extent of missing data and the reasons behind blank responses. There are a range of different reasons for missing data **(Table 17)** which vary in their likely impact on data.

Table 17. Causes of Missing Data

Term Applied	Causes
Non-sample	Observations in a population not included in the sample
Not Applicable	Example: 'Number of EP orders' only applicable for those who use system for ordering
Procedural Factors	Data entry; disclosure restrictions; failure to complete questionnaire
Respondent Related	Refusal to respond – sensitive, no opinion, lack of knowledge, confusion

Missing Value Analysis (*MVA*) is used to identify patterns of missing data. Determining the best remedy for blank responses requires testing the randomness of missing data. The term 'missing at random' (*MAR*) is applied if missing values of Y are dependent on X, but not on Y. Missing data is termed 'missing completely at random' (*MCAR*) if missing values of Y are truly random (Hair *et al.* 1998). T-tests between missing and non-missing groups of Y are performed to determine whether significant differences exist for all other dependent variables.

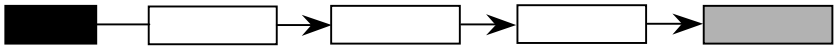
Outliers can occur for a number of different reasons. **Table 18** shows the common causes of outliers and the usual action taken in each case.

Table 18. Dealing with Outliers

Cause of Outlier	Action usually taken
Procedural Error (data entry error / miscoding)	Correct or Delete
Extraordinary Event Explained	Retain – if you want subject represented
Extraordinary Event Unexplained	Delete
Ordinary range for each variable, but unique combination of values across variables	Retain

Outlier testing involves calculating respondent *Mahalanobis Distances* and checking standardised scores for exceptional values. Additionally, linear regression is run with *EPQ* variables as independent variables and the single rating for overall e-procurement quality (*OEPQ Rating*) as the dependent variable. The histogram and normality plot of standardised residuals, and scatter plot of standardised residuals versus standardised predicted values are then analysed to identify outliers. All data is screened to detect non-linear relationships using scatter plots. Multivariate normality is examined using histograms, *PP* and *QQ* tests. The level of correlation between variables is tested by a number of statistical methods, including anti-image matrix, *KMO* measure of sampling adequacy, and Barlett's test of sphericity. The results of all pre-analysis tests are shown in section 6.1.3.

4.6.4 Phase 3 Analysis



The aim of *Phase 3* analysis is to examine the structure of *Perceived EPQ*, to validate the proposed *EPQ Scale*, and to assess alternative construct operationalisations. Factor analysis is used to examine the latent structure of *Perceived EPQ.* The nine-stage process includes method selection, factor design, assumption testing, factor retention, extraction selection, rotation selection, interpretation, purification, and creation of composite measures. The decisions and data analysis for this process are presented in section 6.1. In assessing how well the refined *EPQ Scale* measures *Perceived EPQ*, a number of tests for reliability and validity are carried out **(Table 19)**. Data analysis from these tests is presented in section 6.2.

Table 19. *EPQ Scale* Validation

	Type	Measures Used
Reliability	Test-Retest	N/A
	Parallel Forms	N/A
	Internal Consistency	➔ Cronbach Alpha ➔ Item-to-Total
Validity	Content	➔ Assessment of Scale Explication ➔ Expert Panel
	Construct	➔ Single Factor Loading ➔ High Factor Loading ➔ Correlation with Independent Measure (*OEPQ*)
	Predictive	➔ Regression Analysis ➔ *ANOVA* of Residuals

Finally, *Phase 3* data is used to assess two operationalisations of *Perceived EPQ* – one using paired-statements and the other using a single-statement approach. Analysis involves replicating the factor analysis and validation process for gap variables (Section 6.1 and 6.1) using 'perceptions-only' data. Section 6.3 presents data analysis comparing the two methods of calculation.

4.6.5 Conclusion on Phase 3 Questionnaire Methods

Table 20 summarises the decisions made in relation to questionnaire methods used in *Phase 3.* This phase of the study focuses on examining the structure of *Perceived EPQ*, validating the *EPQ Scale,* and comparing scale calculation options. The questionnaire has generated of a large data set relating to internal customer perceptions of e-procurement delivery across four cases. As such, it offers a way of validating 'verbal reports' from *Phase 1* and *2* (Yin, 1994). Given the exploratory nature of the research, questionnaire distribution is limited to individuals within four organisations. This is in line with other scale development studies (cf. Parasuraman *et al.* 1988; Reynoso & Moores, 1995; Finn *et al.* 1996). The high response rate can be attributed to the questionnaire design, pilot testing, contact with potential respondents, and the relevance of the study. The results of data analysis from *Phase 3* are provided in chapter six. The next section describes the methods used in the *Replication Study,* which seeks to assess the proposed *EPQ Scale* in a different e-procurement context.

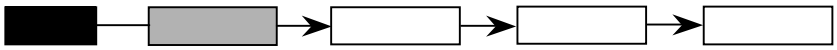
Table 20. Questionnaire Method Decisions (*Phase 3*)

Objectives		**1. Examine structure of *Perceived EPQ*** **2. Validate proposed *EPQ Scale*** **3. Assess calculation options for the *EPQ Scale***	
Issues		**Decisions**	**Rationale / Comments**
Phase 3	Design	Sample 295 from 4 cases 5 pg, closed questions, simple language, +ve wording, 1-7 Likert scales Pilot testing: Academics + 18 users / 3 organisations	100% sample in case setting Examination of other questionnaires for techniques Literature debate on mixed wording Improve questions, structure, and format
	Collection	Mail distribution 274 usable (92.9%)	Contact with all potentials to increase response rate
	Preparation	Data onto *SPSS* Non-response t-tests Missing Value Analysis Mahalanobis + Residuals Scatterplots Histograms, *PP* + *QQ* *KMO* + Bartlett tests	Test for accuracy of data entry Test for non-response bias Test how random missing data is Test for outliers Test for non-linear relationships Test of multivariate normality Test of correlations between variables
	Analysis	Factor analysis Cronbach Alpha Item-to-totals Pearson Correlation Multiple Regression *ANOVA* of residuals	Explore underlying structure of *EPQ* variables *EPQ Scale* validation + comparison of two construct operationalisations.

4.7 Research Methods – Replication Study

This section examines the methods used in the *Replication Study*. Yin (1994) argues that in order to test theories, replication in similar contexts is necessary. Such replications create increased confidence in the external validity of research findings. In attempting to develop a tool to measure a construct, the following research cycle is suggested (Doll *et al.*, 1994): (1) the use of exploratory research to develop a measurement scale through the analysis of empirical data and (2) confirmatory studies to test a hypothesised scale using new data in the same referent population. Therefore, the main objective of this phase is to assess how well the findings from the U.K. study stand up in a new e-procurement environment and suggesting any areas for improvement. The section starts by addressing questionnaire design and is followed by a review of how data was collected, prepared and analysed.

4.7.1 Replication Questionnaire Design

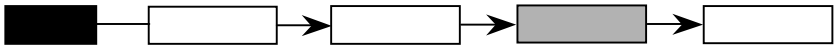


An online questionnaire was designed, incorporating the 30 variables from the refined *EPQ Scale*. As noted in section 4.6.1, there is an inverse relationship between questionnaire length and response rate. Because the Dutch study examines a broad range of e-procurement issues, it was important to keep the questionnaire length to a minimum. Rather than adopt the paired-statement approach, as used in the U.K. study, it was decided to apply a single-statement approach with perceptions statements. This still enables an appropriate comparison when validating the findings of the original scale, whilst ensuring that individuals have not been discouraged from responding. Variables are all anchored on a 7-point Likert scale from 'strongly disagree' to 'strongly agree'. In addition, a single *OEPQ Rating* is included to assess predictive power through regression. Pilot testing, using a convenience sample, was used to provide feedback on questionnaire design (Sekaran, 2003). As with *Phase 3* of the U.K. study, this feedback helped to further refine question wording, though no significant changes were made.

4.7.2 Replication Data Collection

Data collection has been undertaken by a team led by Professor Erik van Raaij[4]. However, the analysis of data relating to *Perceived EPQ* has been carried out in the U.K. by the author as part of this study. All 311 users of an e-procurement system at a Dutch university received an e-mail from the purchasing department, inviting them to participate in the study. This was followed up with an e-mail from the researchers, with a link to the online survey as well as a link to opt out of the study. Over a period of three weeks, having sent out two reminders, 154 completed questionnaires were returned. This represented a 50% response rate, which is above the 30% minimum considered acceptable by Flynn *et al.* (1990) and large enough to carry out appropriate analysis. Of the respondents, 78% are female, the median age group is 41-45 years, most have been using the system for over two years, and the majority use the system at least 2-3 times a month. Slightly over 85% have an administrative function, and use the system mainly for ordering office stationary, catering and printing services. Another 10% have a teaching or research position, and use the system to order industrial gases, chemicals, and computer consumables.

4.7.3 Replication Preparation for Analysis



To enable analysis of questionnaires, all data has been entered in *SPSS* version 13.01. The data set has been examined by a second researcher, checking every tenth line against the original questionnaire to ensure no entry errors have been made (cf. Hair *et al.* 1998). Replication data has then been examined for non-response bias, missing data, outliers, linearity, multivariate normality, and variable correlations. These tests are the same as discussed for *Phase 3* preparation for analysis – section 4.6.3. Pre-analysis test results for the replication study are shown in section 7.1.

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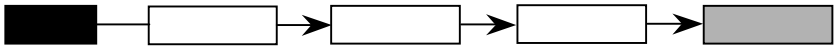
4.6.4 Replication Analysis



The aim of the *Replication* analysis is to identify items, factors, and factor loadings that may be specific to the context in which the original scale has been developed, and to propose improvements the measure. The factor analysis follows the same nine-stage process used for the U.K. study (See section 6.1) and is discussed in section 7.2. Validation of three alternative scales for *EPQ* measurement is presented in section 7.3. This validation process is similar to that used in the U.K. study (See section 6.2). Reliability is assessed by internal consistency, using Cronbach Alpha and item-to-total scores. Content validity is examined through reflection of missing data and discussion with e-procurement users in Holland. Inconsistencies in factor loadings are used to assess the extent of construct validity for the alternative scale options. In addition, the correlation between scale scores and an independent measure of *Perceived EPQ* is used to test for convergent validity. Finally, predictive validity is examined through multiple regression analysis. Replication analysis results are shown in 7.2 and 7.3.

4.6.5 Conclusion on *Replication Study* Questionnaire Methods

Table 21 summarises the decisions made in relation to questionnaire methods used in the replication study. This part of the study focuses on assessing the applicability of the *EPQ Scale* in a different e-procurement context and suggesting any areas for improvement. The results of data analysis from the replication study are provided in chapter seven. The next section examines tactics for ensuring quality of research findings.

Table 21. Questionnaire Method Decisions (*Replication 1*)

Objectives		**1. Validate structure of Perceived EPQ** **2. Assess alternative EPQ Scale options**	
Issues		**Decisions**	**Rationale / Comments**
Replication Study	Design	Sample 311 from 1 case 30 perceptions statements 2pg *EPQ* / 6 pg total closed questions, simple language, +ve wording, 1-7 Likert scales Pilot testing: Academics + 10 users	100% sample in single case Examination of other questionnaires for techniques Improve questions, structure, and format
	Collection	E-mail distribution 154 (49.5%)	Ease of data entry, but may reduce response rate
	Preparation	Data onto *SPSS* Non-response t-tests Missing Value Analysis Mahalanobis + Residuals Scatterplots Histograms, *PP* + *QQ* *KMO* + Bartlett tests	Test for accuracy of data entry Test for non-response bias Test how random missing data is Test for outliers Test for non-linear relationships Test of multivariate normality Test of correlations between variables
	Analysis	Factor analysis Cronbach Alpha Item-to-totals Multiple Regression	Test underlying structure of *Perceived EPQ* *EPQ Scale* validation + comparison of alternative scale options in new setting

4.8 Ensuring Quality of Research

To make a contribution to knowledge, it is important to demonstrate quality of research in terms of reliability and validity (Yin, 1994). Three broad criticisms are levelled against case study research (Gummesson, 1991) – lack of statistical validity, failure to test hypotheses, inability to generalise.

Some academics see an inherent trade-off between the statistical validity of survey research and the in-depth nature of case studies. For example, Miles (1979) discusses the tension between the contextually specific nature of cases and the importance of making sense across the entire population. He asks, 'must we trade close-up descriptive validity for accurate, but 'thin' generalisation?' However, it is argued that case study research *can* yield generalisations, but these are 'theoretical' rather than statistical (cf. Glaser & Strauss, 1967; Yin, 1994). Yin (1994) suggests that it is possible to reach a fundamental understanding of structure and process through the

use of comprehensive measures, even in a single case. Rather than the superficial establishment of cause-and-effect relationships, he argues that the key is to really grasp the interaction between different parts of a system. Generalisations can be made based on case study research findings, provided they are based on a well defined and rigorous design. The quality of research can be assessed in terms of reliability, construct validity, internal validity, and external validity (Yin, 1994; Miles & Huberman, 1994). These are now discussed in turn.

4.8.1 Ensuring Reliability

Reliability refers to the ability to replicate findings. This is important in critical realist research, because the assumption is made that objective reality does exist. Therefore, results should be repeatable. Yin (1994) suggests two tactics to ensure reliability of findings – *case study protocol* and *case study database.* In order to prove reliability, the collection of data, documentation and case write up have all been filed and made available to other researchers. In this study, raw data included all interview recordings, transcripts and secondary documentation. Code sheets, post-interview contact sheets, and code boards all form summaries of the data and the link in a 'chain of evidence' between raw data and analysis (Yin, 1994; Easterby-Smith *et al.* 1997).

4.8.2 Ensuring Construct Validity

Construct validity is concerned with establishing appropriate operational measures for the construct being studied. Yin (1994) suggests three tactics that can ensure case study research has high levels of construct validity – a chain of evidence, data triangulation, and a review by informants. As with reliability, establishing a chain of evidence is important to allow other researchers to follow the same process and arrive at similar results. Triangulation of data is critical in developing a robust measure of *Perceived EPQ.* The use of both qualitative and quantitative methods helps to ensure that the construct is appropriately conceptualized (cf. Jick, 1979; Bryman, 2001). Finally, findings have been continually reviewed by those involved throughout the study. This involves assessment of selective codes, feedback on questionnaires, and discussion of findings at various points during the study.

4.8.3 Ensuring Internal Validity

Internal validity refers to the identification of causality between dependent and independent variables (Emory & Cooper, 1991). This test is given great attention in experimental research, focusing mainly on 'spurious effects' (Sekaran, 2003). However, the case study approach does not seek to prove cause-and-effect relationships. The researcher can infer that a particular event resulted from some earlier event (e.g. Positive ratings for *EPQ* variables result in positive ratings for *OEPQ Rating*), without categorically proving that *x* directly led to *y*. Therefore, the key for exploratory work is to examine rival explanations and consider the convergence of evidence. *Pattern matching* involves comparing empirically-based patterns with predicted patterns. In this study, predicted patterns based on qualitative work are compared with patterns from quantitative work. Yin (1994) argues that internal validity is demonstrated if there are high levels of congruence between the patterns from different sources of data.

4.8.4 Ensuring External Validity

External validity is the extent to which findings can be generalised beyond the original case studies. Unlike purely empirical work, where generalisability is ensured through statistical sampling and rigorous statistical methods, the case approach relies on theoretical sampling (Glasser & Strauss, 1967). This allows analytical, as opposed to statistical, generalisation. However, Yin (1994) argues that in order to test theories, replication in similar contexts is necessary. He argues that such replications create increased confidence in the external validity of research findings. This is why a replication study has been carried out in Holland. This study, presented in chapter seven, goes some way to delivering results that can be generalised statistically, as well as theoretically.

4.8.5 Conclusion on Quality of Design

In conclusion, the reliability of findings is ensured by following a research protocol and maintaining a database of raw data on which *Perceived EPQ* is modelled. The use of code sheets, post-interview contact sheets, and code boards provide the link in a chain of evidence between raw data and analysis. Construct validity, is ensured through the chain of evidence, as well as data triangulation and review by informants. Pattern matching helps to ensure internal validity. External validity is gained through both analytical generalisation in the main research and statistical generalisation in the replication study. **Table 22** summarises the tactics used in the study to ensure quality of findings.

Table 22. Testing Case Study Design

	Case Study Tactic	Phase of Research
Reliability	Use case study protocol Develop case study database	Data collection Data collection
Construct Validity	Establish chain of evidence Use multiple sources of evidence Review of findings by key informants	Data collection Data collection Composition
Internal Validity	Pattern matching - comparing empirical and predicted patterns	Data Analysis
External Validity	Theoretical sample - analytical generalisation Theory testing - statistical generalisation	Main Study Replication Study

Summary

This chapter has examined the philosophical underpinnings of the research in terms of ontology, epistemology, human nature and methodology. The study adopts a critical realist position, arguing that objective reality does exist, but is moulded by research mechanisms. Additionally, knowledge is socially and historically conditioned and therefore fallible to error. Voluntarism is partial as a result of cultural influence (country, religion, profession, age etc). Abductive reasoning is applied based on the critical realist stance. A case approach is used, because it is seen as the best way to undertake an in-depth investigation of *Perceived EPQ*. The case is termed exploratory, because the main focus of the study is on theory building. A cross-sectional, multiple-case approach is applied with a theoretical sample of typical cases.

In line with advocates of triangulation, the study employs both qualitative and quantitative methods. In delineating *Perceived EPQ, Phase 1* of the study uses semi-structured interviews with 23 individuals, which have been recorded, transcribed, open-coded, and grouped into axial codes. *Phase 2* involves refining the proposed components of *Perceived EPQ* and developing a measure of the construct – the *EPQ Scale.* Semi-structured interviews have been carried out with 35 e-procurement users in a further three cases. These have been recorded, transcribed, and coded based on axial codes. Subsequently, axial codes have been refined using a process of selective coding. These codes have been validated using descriptive data from *Phase 2* interviews. The proposed *EPQ Scale* is defined by the final group of selective codes. Questionnaire data has been used in *Phase 3* to examine the structure of *Perceived EPQ*, validate the proposed *EPQ Scale,* and assess alternative construct operationalisations. Both factor analysis and regression analysis have been used during *Phase 3.* Questionnaires have also been adopted for *Replication Study*, with the aim of testing research findings in a different e-procurement setting and identify items, factors, or factor loadings that may be specific to the original study setting. **Table 23** summarises the main meta-theoretical and methodological decisions made for the *Perceived EPQ* study.

Table 23. Key Decisions Made for the *Perceived EPQ* Study

Objectives		**1. Model *Perceived EPQ***	
Issues		**Decisions**	**Rationale / Comments**
Ontology		Realism	Research mechanisms mould the researcher's perception of reality
Epistemology		Critical Realism	Knowledge is socially and historically conditioned
Human nature		Determinism / Voluntarism	Freedom of choice limited by cultural factors
Methodology		Exploratory Pluralism	Abductive reasoning – theory development based on observations / perceptions, followed by testing (i.e. induction ➔ deduction)
Interference		Low	Correlational rather than causal
Time Horizon		Cross-Sectional	Time, effort, and costs of longitudinal work
Setting		Field Study	Non-contrived, no manipulation required
Researcher Role		Investigative	Not seeking intervention
Research Design		☒ Experimental ☒ Survey ☒ Qualitative ☒ Action Research ☑ Case Study	Not seeking to prove cases-and-effect relationships Not testing theory through deduction in 1st instance Only qualitative methods - limits external validity No active intervention in e-procurement delivery Theory building, in-depth study, emphasis on context Answer exploratory 'what' questions, as well as 'how' and 'why' questions
Methods		☒ Participant observation ☑ Historical Archives ☑ Interviews ☑ Questionnaires	None beyond observation in *EMI* & *LAUG* meetings Used to support primary data collection Delineating *Perceived EPQ* / Developing *EPQ Scale* Validating *EPQ Scale* Examining structure of *Perceived EPQ* Assessing calculation options for measurement scale Replication study
Case Study Approach	Type of case	Exploratory	Predominantly theory-building
	Case Selection	4 Cases U.K. 1 Case Holland	Theoretical sampling, based on selection criteria
	Number of Cases	Multiple-Case	Increased generalisation through 'typical' cases, rather than single 'unique' cases
	Level of Analysis	Cross-case	Development of *Perceived EPQ* measure
Phase 1 & 2	Design	Semi-structured Investigative Interviewer Recording & transcription	Use of interview guide Minimise response bias: informal talks / cross-check Minimise interviewer bias: non-leading questions Focus on listening, questioning and probing Creates chain of evidence
	Collection	Duration: 45-120 minutes Interviews: 58 Profile: internal customers	In-depth insight rather than statistical representation Additional informal interviews prior to *P1* & *P2* Additional preliminary work with service providers

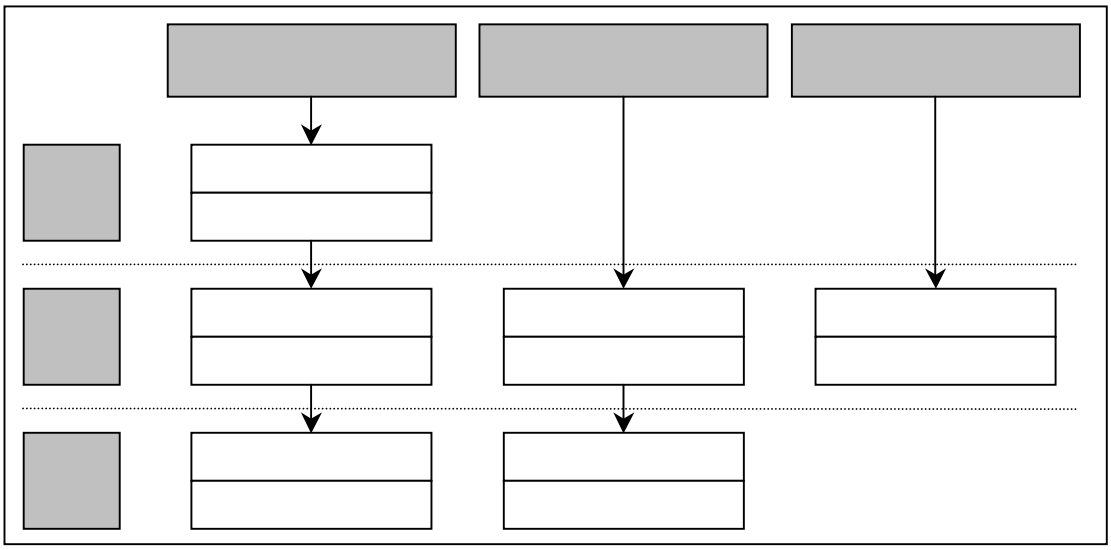
	Preparation	Transcription Coding *P2* Data onto *SPSS*	70 hours of interview, total 324,000 words 3 sources: literature list, interview notes, contact summary sheets Initial *EPQ Scale* testing
	Analysis	*P1*: Axial Coding *P2*: Selective Coding Scatter plots Correlation Regression analysis	83 open codes to 29 axial codes 29 axial codes to 33 selective codes Initial *EPQ Scale* Testing
Phase 3	Design	Sample 295 from 4 cases 5 pg, closed questions, simple language, +ve wording, 1-7 Likert scales Pilot testing: Academics + 18 users / 3 organisations	100% sample in case setting Examination of other questionnaires for techniques Literature debate on mixed wording Improve questions, structure, and format
	Collection	Mail distribution 274 usable (92.9%)	Contact with all potentials to increase response rate
	Preparation	Data onto *SPSS* Non-response t-tests Missing Value Analysis Mahalanobis + Residuals Scatterplots Histograms, *PP* + *QQ* *KMO* + Bartlett tests	Test for accuracy of data entry Test for non-response bias Test how random missing data is Test for outliers Test for non-linear relationships Test of multivariate normality Test of correlations between variables
	Analysis	Factor analysis Cronbach Alpha Item-to-totals Pearson Correlation Multiple Regression *ANOVA* of residuals	Explore underlying structure of *EPQ* variables *EPQ Scale* validation + comparison of two construct operationalisations.
Replication Study	Design	Sample 311 from 1 case 30 perceptions statements 2pg *EPQ* / 6 pg total closed questions, simple language, +ve wording, 1-7 Likert scales Pilot testing: Academics + 10 users	100% sample in single case Examination of other questionnaires for techniques Improve questions, structure, and format
	Collection	E-mail distribution 154 (49.5%)	Ease of data entry, but may reduce response rate
	Preparation	Data onto *SPSS* Non-response t-tests Missing Value Analysis Mahalanobis + Residuals Scatterplots Histograms, *PP* + *QQ* *KMO* + Bartlett tests	Test for accuracy of data entry Test for non-response bias Test how random missing data is Test for outliers Test for non-linear relationships Test of multivariate normality Test of correlations between variables
	Analysis	Factor analysis Cronbach Alpha Item-to-totals Multiple Regression	Test underlying structure of *Perceived EPQ* *EPQ Scale* validation + comparison of alternative scale options in new setting

The next three chapters present data analysis from *Phase 1* and *2*, *Phase 3*, and the *Replication Study.* In combination they demonstrate the progression from initial ideas of how *Perceived EPQ* might be modelled, based on the literature review, to a clear definition of the construct based on empirical data analysis. Furthermore, the analysis reveals answers to the three research questions:

RQ1: What are the components of Perceived EPQ?
RQ2: What is the structure of Perceived EPQ?
RQ3: How can Perceived EPQ measurement be operationalised?

Data analysis follows the process laid out in **figure 23.** *Phase 1*(*P1*) focuses on identifying potential components of *Perceived EPQ*, whilst *Phase 2* (*P2*) applies a coding process to refine these components and proposes a tool for measurement tool for the construct – the *EPQ Scale. Phase 3* (*P3*) explores the structure of *Perceived EPQ* by grouping components that are highly correlated into factors. It then validates the refined *EPQ Scale*, and compares alternative ways to operationalise the construct. The replication study (*R1*) focuses on validating research findings in relation to research questions one and two.

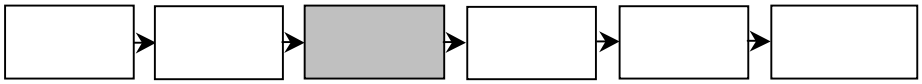
Figure 23. Empirical Analysis Process Diagram



* O-A-S: Coding Process - Open Coding > Axial Coding > Selective Coding

The next chapter begins this process by presenting empirical analysis from *Phase 1* and *2* of the study.

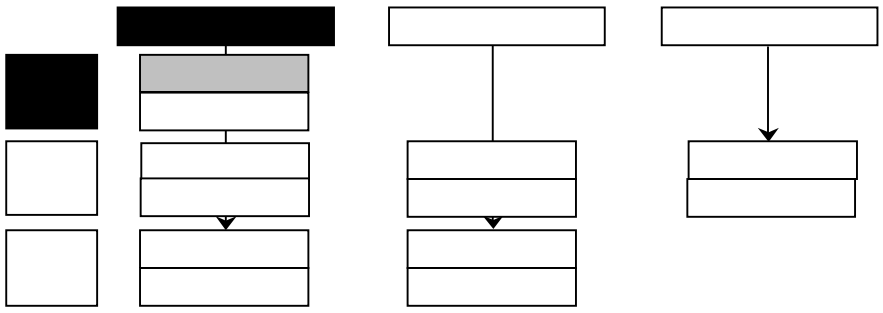
Chapter 5: Phase 1 & 2 Empirical Analysis



This chapter presents empirical analysis from *Phase 1* and *2* of the study. As we recall from section 4.5, these phases have two objectives – to delineate *Perceived EPQ* and to develop a measurement scale for the construct. Semi-structured interviews have been used to collect data from a total of 58 individuals in four cases (Sections 4.5.1, 4.5.2, and 4.5.5). A process of coding, moving from open codes, to axial codes, to selective codes (Glaser & Strauss, 1967), has been used to generate a set of variables that can be used to measure *Perceived EPQ* (Sections 4.5.3, 4.5.4, 4.5.6, and 4.5.7). These components have then been tested based on descriptive data from *Phase 2* interviews (Section 4.5.7).

Section 5.1 presents empirical data from the coding process, with the aim of identifying and refining components of *Perceived EPQ.* The final set of selective codes is used in the proposed *EPQ Scale.* The components of this scale are presented in sections 5.2 and 5.3, with a discussion of how they relate to the study and to antecedent literature. Finally, section 5.4 presents analysis of components validation, based on interview data from *Phase 2.* Based on this validation, a measurement scale for *Perceived EPQ* – the *EPQ Scale* – is proposed at the end of the chapter.

5.1 Delineating Perceived EPQ



As highlighted in the diagram above, this section uses data from *Phase 1* and *2* to examine *Research Question 1.* It focuses on the coding process used in this part of

the study. The approach to analysis is described in sections 4.5.4 and 4.5.7. The aim of the process is to identify and refine components of *Perceived EPQ*, by moving from a large set of open codes, to a refined set of axial codes, and on to a final set of selective codes (Glaser & Strauss, 1967).

5.1.1 *Perceived EPQ* Open Codes

As noted in section 4.5.3, transcribed interviews from *Phase 1* interviews have been coded based on three sources – a provisional 'start list' derived from the literature review, notes from all interviews, and post-interview contact summary sheets. This has led to a list of open codes shown in **Table 24.** The columns represent the 23 interviewees from *Essex County Council*, with crosses indicating that a particular variable is referred to in the transcript. The last column indicates the percentage of all respondents referring to particular codes. The number of references for the initial set of 83 codes varies considerably. For example, 33 codes are mentioned by less than 20% of interviewees, whilst 18 are found in over 50% of transcripts. From an internal customer perspective, key components of *Perceived EPQ* include *system reliability, server speed, system navigation, loaded suppliers, catalogue content, search, speed of order processing, ease of authorisation, order-to-supplier speed, support availability, responsiveness, knowledge, friendliness, training timing, training approach,* and *communication.* The content of these open codes suggests that internal customers place similar importance on both *system* and *support* aspects of e-procurement delivery.

5.1.2 *Perceived EPQ* – From Open Codes to Selective Codes

As noted in section 4.5.4, whilst the high level of detail gained through open coding is useful in the first instance, one of the aims of the study is to develop a measurement scale for *Perceived EPQ.* Therefore, it is necessary to group codes with similar characteristics in order to arrive at a more usable set of variables for use in the *EPQ Scale.* Axial coding, used in *Phase 1* analysis, reduces the initial set of 83 open codes to 29 axial codes.

Table 24. *Perceived EPQ* Open Codes

VARIABLE / CODE NAME	PHASE ONE RESPONDENTS																							Referral %
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	
FMS Integration		x					x			x			x	x		x	x			x		x		39
Improved Budgeting							x									x								9
Goods Receipting		x			x					x	x		x	x										26
Auto-payment		x									x			x		x								17
Payment: different currencies		x												x										9
Late Payment		x												x										9
Advance Payment		x																						4
Customisation	x	x							x	x			x	x		x				x	x			39
System Flexibility		x				x			x					x					x					22
Management Information		x					x		x					x			x	x						26
Reporting			x							x				x			x	x		x				26
Report Searching						x											x							9
Complex Orders		x			x	x					x		x	x					x			x		35
Processing Services		x			x						x		x	x	x				x			x		35
Security	x	x	x						x	x			x						x		x	x		39
Sharing Information		x																						4
Reliability: server		x	x		x	x			x		x	x	x		x	x		x	x		x		x	61
Reliability: system	x	x			x	x		x		x		x		x	x			x			x	x	x	57
Access				x					x			x	x		x			x				x	x	35
Reliability - saving information					x						x		x											13
Server Speed	x		x	x	x	x			x	x	x		x		x	x		x	x		x		x	65
Navigation	x	x	x	x	x		x	x	x	x	x	x	x			x	x		x		x		x	74
User Friendliness					x	x	x	x					x			x	x							30
Navigation -rules		x			x		x							x			x							22
Navigation - terminology						x			x			x							x					17
Navigation - number of stages						x				x	x													13
Visual Appeal			x	x	x								x					x					x	26
Loaded Suppliers		x			x		x	x			x	x	x			x	x		x		x	x		57
Accreditation						x										x								9
Catalogue Content	x		x		x			x	x	x	x	x	x	x	x			x	x		x		x	65
Number of Catalogues	x			x				x		x		x	x		x				x		x		x	44
Search - general	x		x	x	x		x	x	x	x	x	x	x		x	x	x		x		x	x	x	78
Search - terminology	x				x		x	x	x	x		x							x			x		39
Search - language	x				x		x			x	x		x				x					x		35
Search - pictures	x				x			x							x				x		x			26
Search - frequency of Use	x									x		x												13
Speed of Processing		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x		x	x		x	78
Order Cloning					x	x														x				13
Efficiency	x								x										x					13
Authorisation - ease	x						x	x		x		x	x			x	x	x	x	x			x	52
Authorisation - speed							x				x					x	x	x		x				26
Self-Authorisation	x			x			x			x														17
Authorisation - rules		x				x																		9
Budget Codes							x																	4
Order to supplier - speed	x	x		x	x					x			x	x		x			x	x	x		x	52
Orders to supplier - reliability		x		x	x	x		x			x	x		x	x									39
Supplier Training					x	x							x						x					17
Order to supplier - accuracy						x					x			x										13
Lead-time		x							x	x					x		x	x		x				30
On-time Delivery									x	x				x	x					x				22

Continued…

VARIABLE / CODE NAME	PHASE ONE RESPONDENTS																							Referral %
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	
Order Accuracy									x					x		x		x		x			x	26
Support Availability	x	x		x	x	x	x	x			x	x	x	x		x	x		x		x		x	70
Availability - one point of call	x					x	x			x	x						x							26
Advertised Support						x						x									x			13
Advanced Queries (EGS)						x				x														9
Support Reliability	x									x				x		x			x		x			26
Responsiveness	x		x	x	x	x	x	x	x	x	x		x		x			x	x			x	x	70
Knowledge	x		x	x		x		x	x	x			x	x	x					x		x		52
Talking Users' Language		x	x						x		x			x				x		x	x			26
Flexibility						x					x							x	x					17
Dealing with Problems			x		x			x	x		x	x						x					x	35
Helpfulness				x						x												x	x	17
Confidentiality			x						x													x		13
Friendliness	x		x		x			x	x	x			x		x			x	x			x	x	52
Concern & Empathy	x		x	x				x	x	x			x		x			x					x	35
Talking Users' Language		x	x						x		x			x				x		x	x			26
Training - timing	x	x	x		x	x	x	x	x	x	x		x			x	x	x	x		x			70
Training - delays and politics							x										x							9
Training - availability								x																4
Training - approach		x	x	x	x	x	x	x	x		x	x	x	x		x	x	x		x	x	x	x	83
Training - amount	x		x			x	x		x	x		x				x	x		x					44
Training - content	x	x				x	x	x		x		x	x			x			x					44
Training - self learning	x			x				x		x	x	x		x	x					x			x	44
Training - super user cascade				x		x					x				x									17
Training - resource issues						x	x											x		x				17
Training - user knowledge								x						x										9
Training - refresher courses						x				x														9
Communication		x			x	x	x				x		x	x	x		x				x	x	x	52
Inform of suppliers / contracts			x		x				x		x		x	x				x						30
Communication Cascade				x	x	x									x									17
Communication Problems				x							x		x											13
Use of Intranet				x									x									x		13
Encouraging Feedback					x	x					x	x	x						x			x		30

Phase 2 data is used to further refine this set of codes through interviews with 35 e-procurement users in *Tendring District Council, Maldon District Council, and Braintree District Council* (Section 4.5.5). Having coded transcripts from these interviews, it is possible to reassess *Phase 1* axial codes in light of new data from *Phase 2* (Section 4.5.7). Refinements to axial codes and review with users, procurement managers, solution providers, and academics, have resulted in a set of 33 selective codes that are considered to adequately delineate *Perceived EPQ.* The initial open codes and final selective codes are shown in **figure 24.** Based on the final set of selective codes, it is argued that *Perceived EPQ* is comprised of 33 variables. It is proposed that the construct may be measured as the gap between internal customer expectations and perceptions across these variables. The next section presents the components in detail and discusses how they relate to antecedent literature.

Figure 24. *Perceived EPQ* Selective Codes

Open Code	Selective Code
FMS Integration	FMS Integration
Improved Budgeting	
Goods Receipting	Invoice Reconciliation
Auto-Payment	
Payment: currencies	
Late Payment	
Advance Payment	
Customisation	System Configurability
System Flexibility	
Management Info	Reporting Capability
Reporting	
Reporting Searching	
Complex Orders	Processing Complex Orders
Processing Services	
Security	System Security
Sharing Information	
Reliability: server	System Availability
Reliability: system	
Access	
Reliability: information	
Server Speed	Screen Loading
Navigation	System Navigation
User Friendliness	
Rules	
Navigation: terminology	
Navigation: no. stages	
Visual Appeal	Visual Appeal

Open Code	Selective Code
Loaded Suppliers	Loaded Suppliers
Accreditation	
Catalogue Content	Loaded Catalogues
Number of Catalogues	
Search	Ease of Search
Terminology	
Language	
Pictures in Search	
Search: frequency of use	
Speed of Processing	Order Processing
Order Cloning	
Efficiency	
Authorisation: ease	Ease of Authorisation
Authorisation: speed	
Self-Authorisation	
Authorisation: rules	
Budget Codes	Orders to Suppliers
Order to supplier: speed	
Order to supplier: reliability	
Supplier Training	
Order to supplier: accuracy	
Lead-time	Order Lead-Time
On-time Delivery	On-Time Delivery
Order Accuracy	Order Accuracy
Support Availability	Support Availability
Availability: 1 point of call	
Advertised Support	
Advanced Queries (EGS)	

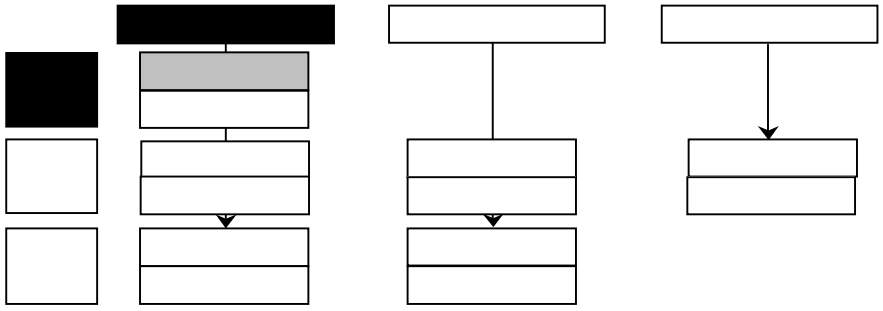
Open Code	Selective Code
Support Reliability	Support Reliability
Responsiveness	Support Responsiveness
Knowledge	Knowledge
Talking Users' Language	Talking Users' Language
Flexibility	Support Flexibility
Dealing with Problems	Problem Resolution
Helpfulness	
Confidentiality	Confidentiality
Friendliness	Friendliness
Empathy	Concern Shown
Training: timing	Timely Training
Training: delays / politics	Appropriate Training
Training: availability	
Training: approach	
Training: amount	
Training: content	
Training: self learning	
Training: super user	
Training: resource issues	
Training: user knowledge	
Training: refreshers	
Communication	Information Provision
Inform of new suppliers	
Communication Cascade	
Communication Problems	
Use of Intranet	
Encouraging Feedback	Encouraging Feedback

.2: At the moment IFS [the FMS at Essex CC] and Marketplace don't seem to speak to one nother. So the order has to be looked at by a lady in finance.

.7: We have money which is shifted from one budget to another budget and that won't show up on Marketplace. You can do a report, but it is not going to show a true reflection of your budget.

.21: If everything is going to be done electronically you should be able to push a button on a udget code and it tells you how much you have spent, how much is still pending and how much e have got left to spend – it should not be hard.

5.2 Proposed Components of Perceived EPQ – System



Based on interview data collected in *Phase 1* and *2* of the study, a process of coding suggested by Glaser and Strauss (1967) has been undertaken in order to delineate *Perceived EPQ* (Sections 4.5.4 and 4.5.7). It is contended that *Perceived EPQ* is defined as the gap between internal customer expectations and perceptions of e-procurement delivery. As such, it is determined by the magnitude of the disconfirmation between expectations and perceptions for 33 *EPQ* components. Prior to further analysis in *Phase 3*, the first 19 variables all appear to relate to the e-procurement *system*. These components are now discussed in detail. For each variable, interviewee quotes are provided to give the reader a sense of context underlying the construct. In addition, the relationship between each variable and the literature is discussed.

5.2.1 *FMS* Integration

The ability of an e-procurement system to work alongside legacy finance systems appears to impact on *Perceived EPQ*. The *IDC* report (2003) states that the speed of roll-out is often slowed down by inadequate system integration. In many cases, data entered onto an e-procurement system is not transferred to the *FMS*, necessitating double-entry of financial data.

11: These people [suppliers] aren't going to get paid! When you bear in mind we are Essex. We an't afford to bad credit anywhere. Their payment terms maybe 30 days but ours are whenever we an actually sort out the mess we have created. [Laughing] We have actually been blacklisted by a company before because we have not paid them.

12: Later on, Marketplace will become more automatic. They will have invoices coming in and if he invoice matches the order it will automatically be paid.

14: The next stage will be when they can send their invoices electronically. Then the order will o out and as long as you invoice the order – match. The invoice will automatically pay as long as omeone has told the machine that it has been received and they will accept it.

13: What you don't need is phone calls and e-mails for each individual order saying can you oods receipt this and goods receipt that. We used to get phone calls and snotty e-mails saying an you goods receipt everything from here through to here. I don't know what it is but I have not ot time to go through every form and goods receipt it. I can just see this goods receipting issue ecoming a real nightmare in six months.

Bailey & Pearson (1983) address system integration directly in their 'computer user satisfaction' item *'the ability of systems to communicate / transmit data between systems servicing different functional areas'*. In addition, the variable can be seen as one aspect of broad dimensions such as *functionality* (cf. Johnston & Silvestro, 1990; Silvestro & Johnston, 1992; Croom & Johnston, 2003), *system quality* (cf. DeLone & McLean, 1992) or *system design* (cf. Baroudi & Oilikowski, 1988).

5.2.2 Invoice Reconciliation

Some e-procurement systems have the capability to automatically match invoices, receipts and requisitions (3-way matching), and enable automatic payment. This can significantly reduce data input and results in less paperwork. The ability to reconcile invoices in this way is not only determined by e-procurement capability, but also the level of *FMS* integration and receipting practice.

Additionally, the ease of invoice reconciliation will impact on the organisation's ability to pay suppliers on time. This last issue is often of particular concern to local authorities, as late payment (*BV8*) is one measure of their performance.

Invoice Reconciliation does not appear to be listed directly in the literature reviewed. This may partly be a result of the external focus of many service quality scales and the fact that automated invoice reconciliation was rarely an option for traditional

.9: Another good thing is you can keep tabs on what you have ordered, because you can have reports at the end of it. Or you can search under different budget codes.

.11: The drawback for Marketplace is that it is not flexible. It is a terribly rigid system and it won't do things that we would like it to do.

.12: Because it is not bespoke the standard EPQ system does not always do what we want to do. You all round it. Again you learn by experience.

.15: I wish we could change more of the settings on the system.

.16: The search-ability would be quicker because they would have an order number and they could stick it in and they could search it rather than flying through it.

procurement systems. However, like *FMS Integration*, it may be viewed as a sub-section of *functionality*, s*ystem quality* or s*ystem design*.

5.2.3 System Configurability

Perceived EPQ may be influenced by the extent to which workflow, budget links, authorisation levels, reporting, and screen appearance can be customised to meet individual requirements.

System Configurability is directly addressed by a limited number of authors in the literature (c.f. DeLone & McLean, 1992; Barnes & Vidgen, 2000, 2001a, 2001b, 2002; Liu & Arnett, 2000; Wolfinbarger & Gilly, 2001, 2003; Voss, 2003). DeLone and McLean (1992) list *'system flexibility'* as an item within *system quality*. Barnes and Vidgen (2002) refer to this aspect as *'creating a sense of personalisation'*, whilst Wolfinbarger and Gilly discuss *'the level of personalisation at the site'*. Under the *quality of information* factor, Liu and Arnett (2000) present an item termed *'customised information presentation'*. Finally, as part of his 'sand cone' model of e-service, Voss (2003) considers *'configuration and customisation'* as part of *customer-centred service*. He uses the example of Dell customers having the ability to configure a PC system to their exact specification.

5.2.4 Reporting Capability

Whilst some individuals only place orders via e-procurement, others will also use the system to generate reports. Perceptions of e-procurement reporting functionality may be influenced by the variety of report options, the ease of searching for management information, the ability to customise various reports, and how well reports link with their *FMS*.

.2: I guess it´s about how much of the total spending can go through the Marketplace and how asy that is. There are certain jobs that don't tie up with the system and we are not using the ystem because it can't do it. It is not flexible enough to do what they want to do.

.6: The functionality of it needs to be appropriate for what people are ordering. The system isn't articularly good at doing a service order - it is a goods commodity system which we knew from he start.

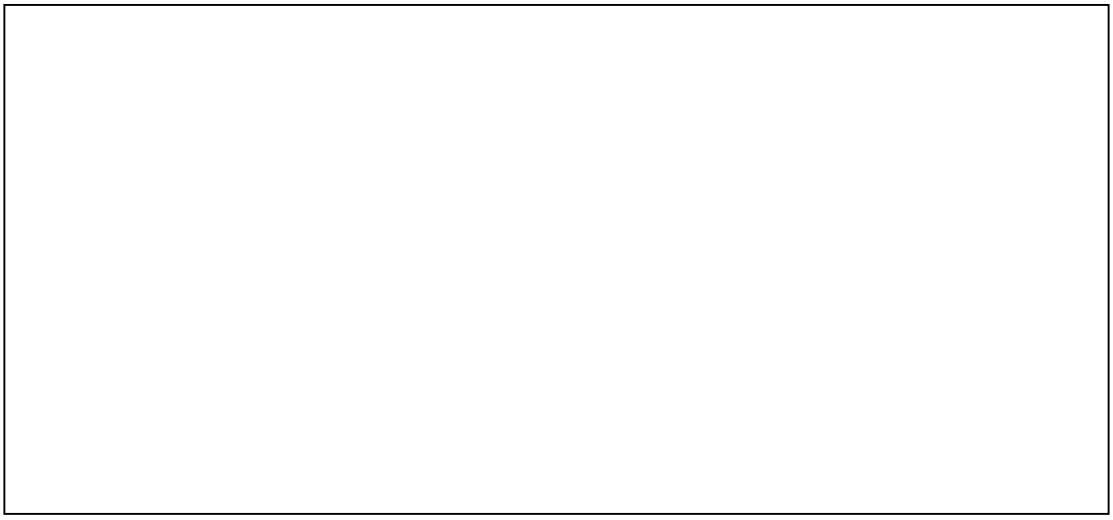
.1: The enhancements that we are going to get in June [2004] will address some of the limitations f those [lack of service order capability] limitations. For example, rather than receipt by quantity e will be able to receipt by £ [UK] value - however the system provided for that this is he ability to do an estimated price order.

.14: I think you will find this will come up more if you talk to someone from social services. Because you are dealing with a lot of variables and it is a bit like [Johnston & Silvestro] nd being a county council you need to be able to, because you are dealing with the public out here.

Doll and Torkzadeh (1988, 1991, and 1999) consider reporting in the *content* element of their *EUCS* model – *does the system provide reports that seem to be just about exactly what you need?'* Additionally, *reporting capability* can be seen as one aspect of broad dimensions such as *functionality* (cf. Johnston & Silvestro, 1990; Silvestro & Johnston, 1992; Croom & Johnston, 2003), *system quality* (cf. DeLone & McLean, 1992) or *system design* (cf. Baroudi & Oilikowski, 1988).

5.2.5 Processing Complex Orders

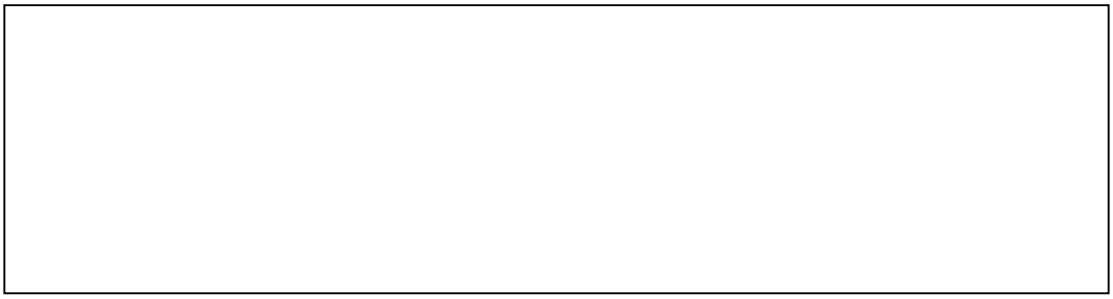
Enabling more complex orders to be placed electronically is a significant challenge for e-procurement system design. For example, accounts departments find it difficult to deal with service orders, because requisitions and invoices rarely match. Such orders require more advanced software to ensure they can be placed via an e-procurement system. Call-off contracts for services may require 'averaging systems' or 'upper/lower control limits' to enable automatic matching and payment. Social services present real challenges for e-procurement systems, because they are often a 'package' of services and each case will draw on different elements of a contract. Whilst e-procurement systems are developing to deal with more complex orders, many remain limited to products that can be catalogued easily. The inability to process complex orders may affect *Perceived EPQ* and may inhibit adoption of the system altogether.



Hendrick and Ruch (1988) allude to the importance of managing complexity in purchasing – *'the amount of complexity of commodity in the buyer's responsibility'* – when discussing the ten important factors used for assessing the performance of purchasing personnel. However, their research is product-oriented and as such only explores complexity of products, not the unique challenges of service orders. As with some of the other system variables listed, the broad dimensions of *functionality / system quality / system design* might include assessments of how well an e-procurement system is able to process complex orders.

5.2.6 System Security

A highly secure e-procurement system should instil confidence amongst users. If there are concerns that other people may be able to access important data or misuse the system, there will clearly be a detrimental impact on *Perceived EPQ.* However, it is interesting to note that some functions designed to maintain security can cause irritation. For example, most e-procurement systems automatically log-out if they have not be accessed within a set time-limit. This is to ensure that the system is not accessed by someone if a user is away from their desk for long periods of time. Whilst the feature is designed to improve security, many see it simply as an inconvenience.



Within *ISQ* literature, only Croom and Johnston (2003) directly explore perceptions of security. The variable is more widely examined by authors in the *E-SQ* literature (cf. Barnes & Vidgen, 2002; Liu & Arnett, 2000; Lociancono *et al.* 2000, 2002; Wolfinbarger & Gilly, 2001, 2003; Yang & Jun, 2002; Zhu *et al.* 2002; Trocchia & Janda, 2003; Yang *et al.* 2003; Gournaris & Dimitriades, 2003; Lim & Dubinsky, 2004; Long & McMellon, 2004). In exploring *system security,* a number of authors use two terms – *privacy* and *security* (c.f. Wolfinbarger & Gilly, 2002; Zeithaml *et al.* 2000, 2002; Yang *et al.* 2003). *Privacy* is concerned with the protection of personal

.2: I would say that Marketplace is a fairly stable thing. All IT systems have their problems. hey're not infallible.

.8: With it being Internet-based it has to be available with very limited down time, so that it is ccessible.

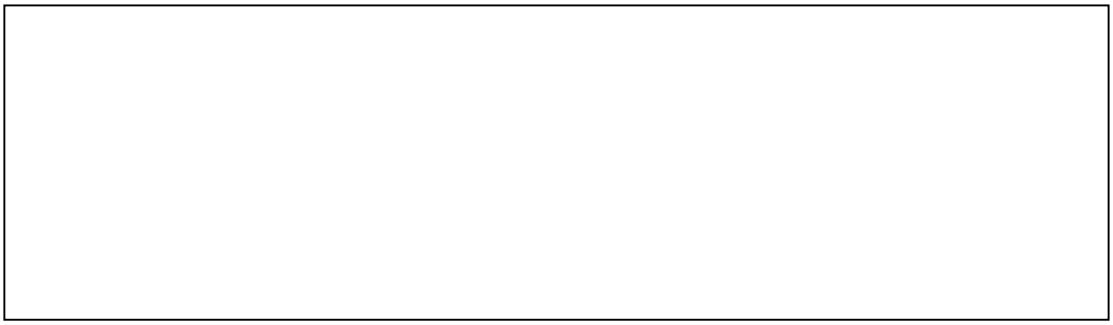
.23: There are problems for some users not in County Hall, because they have got remote dial ccess they are not constantly linked to the Internet.

.2: If there were problems it tends to be with the server rather than the Marketplace.

information and is analogous to *non-financial risk* (Trocchia & Janda, 2003). *Security* is more concerned with the risk of fraud or the loss of financial information. In the *EPQ* context, *system security* is less concerned with privacy issues and more with the protection for financial impropriety. Unlike Internet sites, the focus is not on protecting the end-customer from fraud, but protecting the organisation from misuse. As a result, system privacy may be kept to a minimum, to provide an audit trail and thus ensure appropriate behaviour. Privacy issues are more relevant to off-line dealings with support staff and are incorporated in a different variable – *confidentiality.*

5.2.7 System Availability

If users have difficulty accessing an e-procurement system they are more likely to find alternatives ways of purchasing. *System Availability* is influenced in two key ways. In addition to the inherent reliability of the e-procurement system itself, web-based procurement requires a reliable server link to ensure availability. Even when an e-procurement system itself is robust, perceptions of availability will be damaged if a server is unreliable. This inevitably creates issues for an e-procurement provider, because the server may not be in their direct control. In addition, different units within the same organisation may experience different levels of access, based on their technology infrastructure.



Providing reliable access to a system is discussed in both the *Information Systems Quality* literature (cf. Bailey & Pearson, 1983; DeLone & McLean, 1992) and *E-SQ* literature (cf. Liu & Arnett, 2000; Lin & Lu, 2000; Zeithaml *et al.* 2000, 2002; Zhu *et al.* 2002; Long & McMellon, 2004). The availability of a system is termed *convenience of access* by DeLone and McLean (1992), whilst Lin and Lu (2000) use

.3: It does not happen often, but there are times when it is a bit slow!

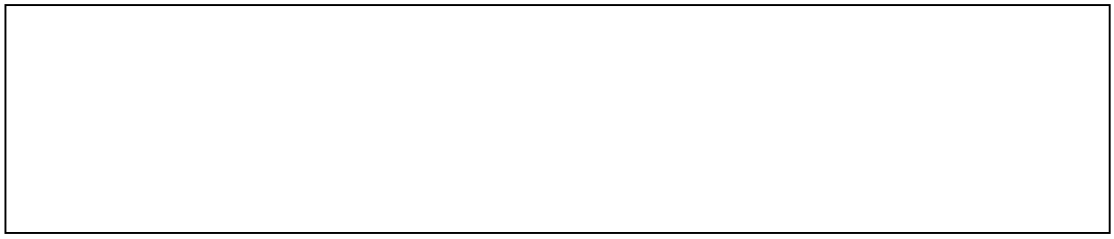
.16: You have completed screen and you click continue, then you have to wait for ages whilst its loves to the next screen. It's annoying, because I can access the system ok, but it's so slow when 'm there.

.6: It is slow at lunch time but that is because everybody is going on the Internet.

the term *system accessibility*, Liu and Arnett (2000) explore *rapid access*, which essentially combines the *system availability* and *screen loading* variables applied in this study. Zeithaml *et al.* (2002) refer to *'the ability of customers to get to a website'* in their *efficiency* factor, which also incorporates issues of *navigation* and *order processing speed*. Croom and Johnston (2003) use the term *accessibility* in their conceptual model of e-procurement impact. They argue that this is an aspect of *process capability.*

5.2.8 Screen Loading

A closely related issue to *system availability* is the speed at which pages of an e-procurement system load. In the majority of cases there will be several stages of an order process and each will be represented by a new page on the system. If there is a significant delay in screen loading, users become understandably frustrated and may abandon orders in favour of alternative purchase methods (e.g. through petty cash or expense claim systems). Therefore, having both a reliable server (*System Availability*) and fast server (*Screen Loading*) can significantly affect *Perceived EPQ.*



Whilst some authors apply quite broad terms that incorporate the availability and the speed of access (cf. Liu & Arnett, 2000; Zeithaml *et al.* 2002), others treat the speed of access as a distinct variable for measurement. Rice (1997) states the speed at which customers can move around the site is a critical success factor. Lederer *et al.* (2000) use an item *'the site loads quickly'* as one aspect of *ease of use*, when applying the technology acceptance model (*TAM*) to an online context. Croom and Johnston (2003) apply the term *speed* in their work as one facet of *capacity.* Likewise, Sweeney and Lapp (2004) consider *speed* when discussing the importance of rapid screen loading and note the fact that perceptions of speed are often a function of the user's computer of Internet provider – i.e. outside the control of the service provider. Long and McMellon (2004) include an item *'retail Internet sites should not have traffic*

.4: It is good because all the information is already there. Delivery addresses etc. It is easier.

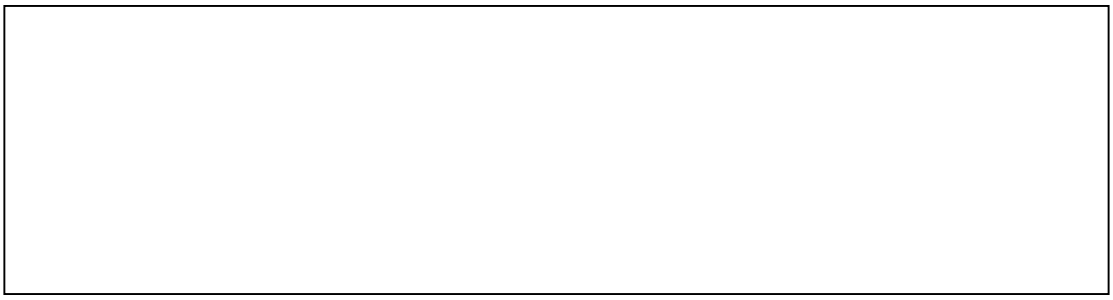
.10: Once you start an order, up comes the front page and you take the number off it. You fill in our boxes and then you automatically move on to stage two and stage three etc. Stage six is where you send it off to somebody else to agree it. It works in a logical way and if you make a mistake you can go back and change it. It does not cause problems.

.7: From a beginner's point of view it is not the easiest system to work with. I don't think it is overly self-explanatory.

problems' as one aspect of tangibility in a *SERVQUAL* application to websites. In doing so, the authors argue that the speed of screen loading is 'physical evidence of service'.

5.2.9 System Navigation

System Navigation relates to the ease with which users are able to find their way (navigate) around an e-procurement system. As such, the item measures individual perceptions of how intuitive / logical the order process is. With a well designed system, users should be able to 'figure the system out' for themselves. People expect to be able to jump back and forward between stages of the process, have any input errors highlighted, find additional information when necessary, and carry out advanced options (e.g. order cloning) with ease.



System Navigation is discussed within the *Information Systems Quality* literature (cf. Doll & Torkzadeh, 1988; Davis, 1989; DeLone & McLean, 1992) and numerous e-service articles (cf.; Rice, 1997; Barnes & Vidgen, 2000, 2001a, 2001b; Liu & Arnett, 2000; Loiciancono *et al.* 2000, 2002; Zeithaml *et al.* 2000, 2002 a&b; Wolfinbarger & Gilly, 2001; Zhu *et al.* 2002; Trocchia & Janda, 2003; Voss, 2003; Sweeney & Lapp, 2004). Voss (2003) states that *ease of navigation* incorporates the following aspects: limiting information per page, helping different users access different parts of the site, intuitive ways of navigation, using logical taxonomy of web pages, allowing book-marking, having a consistent approach to all aspects of e-service, and rapid download. Whilst the first six elements are incorporated in *system navigation* for e-procurement assessments, the last – *rapid download* – is not explicitly an element of navigation, but rather *screen loading.* Clearly, the speed of screen loading will have an effect of perceptions of navigation, so one would expect a high level of correlation between the two variables. Sweeney and Lapp (2004) apply the term *navigation system* when

referring to navigation bars, drop-down menus, page labels, site maps, and site-specific search engines. This contrasts to another category within their *ease of use* group – *structural design and layout* – which is more concerned with the logical flow and sequence of pages. The authors note that these two categories are often both termed *navigation*. In the context of *EPQ*, the two elements are essentially combined. In effect, navigation bars, drop-down menus etc simply aid the logical flow and sequence of the pages.

5.2.10 Visual Appeal

Visual Appeal considers how e-procurement users perceive the site aesthetics of an e-procurement system. Having a system that is visually appealing may help users with navigation as well as making the whole procurement process more enjoyable. The variable incorporates issues such as colour, print size, use of pictures, animation, and clarity.

Visual Appeal is widely applied in *E-SQ* measurement with Loiacono *et al.* (2002) and Wolfinbarger & Gilly, (2003) both applying the same term as this study. Rice (1997) uses *'the site was visually attractive'*, Lederer *et al.* (2000) *'the site displays visually pleasing design'*, Yoo & Donthu (2001) *'aesthetic design'*, Gounaris and Dimitriadis (2003) *'design of Web pages'* and Yang *et al.* (2003) *'aesthetics'*. Trocchia and Janda (2003) define the term *'sensation'* as the extent to which the Internet service provider pays attention to aesthetic aspects of the online shopping experience. Whilst different expressions are applied in the literature, all these variables essentially relate to the same aspect of service delivery.

It is worth noting that *Visual Appeal* is applied predominantly to external customer service quality measures. Brooks *et al.* (1999) examine the differences between internal and external customer expectations. Judging by the interview transcripts, it appears that only a few e-procurement users are overly concerned with the visual appeal of the system. This may be because the system is already meeting

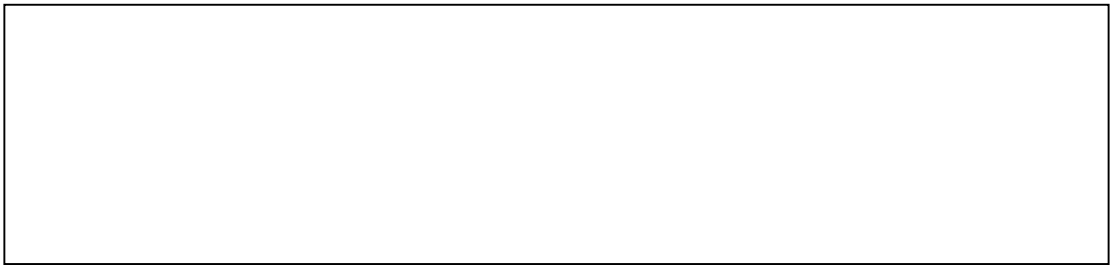
.6: What is happening now is people are asking me to set the supplier up on Marketplace and the irst thing I do is check creditors and if they are not on I say I can't set them up on Marketplace nd say to the creditors this is what we need to do.

.21: The finance people and the procurement guys worked so hard to talk to all of us to try to get s to give them our suppliers that we use on a regular basis so that it was all set up so we would ot have to worry about setting up new suppliers but that was before October [9 month delay] and e have had new suppliers since then.

expectations, but could also reflect the fact that professional customers view site aesthetics as 'window dressing' and therefore relatively unimportant.

5.2.11 Loaded Suppliers

If departments can't access their suppliers, they are likely to find alternative ways to procure goods or services. However, this issue is a complicated one, because from a central purchasing perspective, it may not always be appropriate to load a supplier. For example, one benefit of e-procurement cited in literature is the opportunity to aggregate demand (cf. Croom, 2000; Croom & Jonhston, 2003). However, this may require 'forcing' individuals to buy from an approved supplier. Obviously, there is the potential for resentment from individuals who see their control over purchasing being eroded. Therefore, the *Loaded Suppliers* variable may relate to number of suppliers on the system and the choice of suppliers. Another issue noted in the interviews relates to delays in e-procurement implementation. It is no good having all suppliers loaded on the system, only for users not to have access for another 6-9 months. By this time supplier records are out of date and perceptions of supplier content are inevitably diminished.

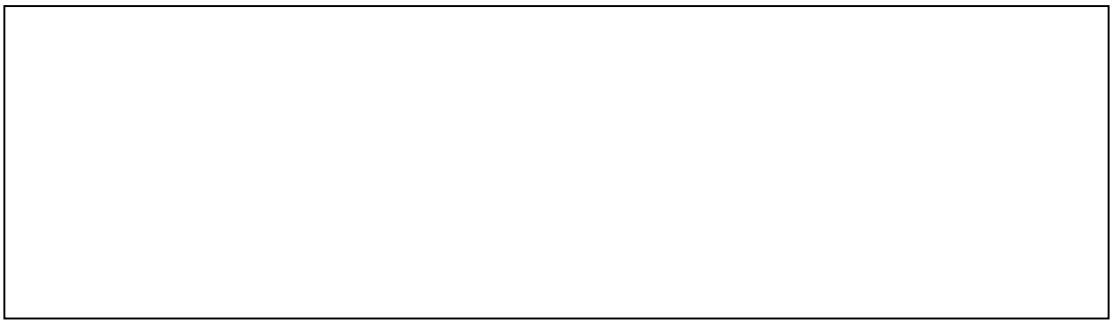


DeLone and McLean (1992) allude to this variable in both *'database accuracy'* and *'database contents'* when measuring the dimension of *system quality*. In measuring *E-SQ* from Internet purchase and non-purchase perspectives, Yang and Jun (2002) consider *'the wide selection of products/services offered'* as an aspect of *availability*, whilst Trocchia and Janda (2003) address the *'variety of products available'* as part of their *access* dimension. Other authors also refer to the variety of merchandise available to customers (cf. Bansal *et al.* 2004; Lim and Dubinsky, 2004). However, these measures are generally covering broad aspects of *content*, rather than specifically examining appropriate *supplier loading*.

:16: I know there are issues around catalogues but the longer term is when we get them improved.
asy to find anything. That is why it is too time-consuming - searching electronically instead of
Ve will have more catalogues on because it is quicker to order from a catalogue if you know what
ou are doing and the catalogues are of a decent quality. *Alistair Brandon-Jones*
Document Services and that is how they were put on the system. If we put in CDS we don't find it.
:17: So there were a lot of items that we might have used that were never put on there. Which
:12: When you search using the catalogues if you put in pen you get sheep pens or something like
ould have led to the problem of searching.
hat! So there is a tendency with the people that I know who have used it to do the free-text
ould like to see more or better catalogues and it is quicker in some ways to do that than to
oing to fill out loads of boxes on a form then you might as well do it on paper.

5.2.12 Loaded Catalogues

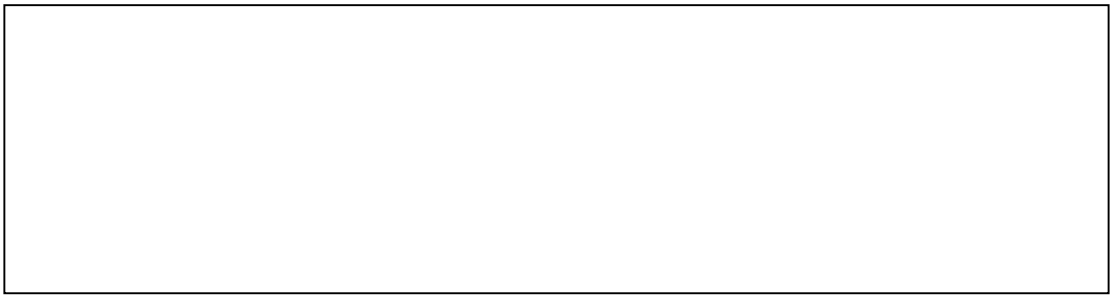
Transaction and price savings are partly driven by aggregation of demand (Croom, 2000). The potential for increased speed of order processing, management information, greater price comparison, and reduced input errors, make e-catalogues a major area of e-procurement development. Ensuring *contract compliance* requires sufficient catalogues on the system, which are easy to access, search and order from.



As with *Loaded Suppliers*, this variable is indirectly covered in some *Information Systems Quality* research (cf. Doll & Torkzadeh, 1988, 1999; DeLone & McLean, 1992, 2000). In *E-SQ* literature, Rice (1997) states that *content* correlates highest (74%) with the likelihood to make a repeat visit to a website. Wolfinbarger and Gilly (2003) refer to the importance of *'good selection'* on a website. Within their *availability* dimension, Yang and Jun (2002) have the item *'the online catalogues contain information about price, model, and others'* in addition to the *'wide selection of products/services offered'*. Likewise, Trocchia and Janda (2003) and Bansal *et al.* (2004) both incorporate this variable in their e-service measures.

5.2.13 Ease of Search

Ease of Search is concerned with how easy e-procurement users find searching for suppliers and items. 'Fuzzy logic' search capability can help to ensure that even when individuals use different terminology, they are still able to find suppliers or items using e-procurement. In addition, the use of pictures and descriptions can help make searching easier.



.6: If I have got a relatively simple order to do and I have got a decent connection I can do an rder in about a minute.

.8: It has now reached a point where it is quicker to use the system than it is to do a paper order.

.12: It's slower because you have got so many different screens to go through.

.9: The best aspect is its speed.

.23: Office services for example may do a weekly stationery order that is similar week on week. o ability to clone an order makes things much quicker.

There appear to be only indirect references to *ease of search* in the *Information Systems Quality* and *Service Quality* literature (cf. Doll & Torkzadeh, 1988; Silvestro & Johnston, 1992; Johnston, 1995; Lederer *et al.* 2000). In the *E-SQ* literature, Rice (1997) directly addresses the ease of search, stating that '*the ease of finding information or content'* is critical to website loyalty. Liu and Arnett (2000) use the term *'customised search functions'*, whilst Zeithaml *et al.* (2000, 2002) refer to *'the ability to find their desired product and information'* within their *efficiency* dimension. Long and McMellon (2004) have an item *'it should be easy to find the products you are looking for at the retail Internet sites you go to'* as part of their *tangibility* factor. Other authors who refer to *ease of search* include Wolfinbarger and Gilly (2001, 2003),) Lim and Dubinsky (2004), Sweeney and Lap (2004), and Bansal *et al.* (2004).

5.2.14 Order Processing Speed

This variable refers to internal customer perceptions of how e-procurement has affected the processing time for orders. If users feel that the time taken to process an order has improved, they are more likely to view e-procurement favourably and use the system.

Davis (1989) has an item regarding time saving resulting from the use of information systems – *'using electronic mail saves me time'*. In developing a measure of procurement *ISQ*, Cavinato (1987) refers to the importance placed on *order speed*, incorporating both *processing* and *delivery speed*. Hendrick and Ruch (1988) include *'the ability to control purchase order cycle time'* as an important factor in assessing the performance of procurement personnel. In the *E-SQ* literature, Zeithaml *et al's* (2000, 2002) *e-SERVQUAL* scale incorporates the *'ability to get onto a site, find goods and check out quickly'* all within the *efficiency* dimension. Trocchia and Janda

(2003) include *'transaction efficiency'* in their *performance* dimension. However, *order processing speed* is just one element of these broad factors. Finn *et al's* (1996) item *'turn purchase requests into purchase orders rapidly'* and Wolfinbarger and Gilly's (2003) *'it is quick and easy to complete a transaction at this website'* are two examples of items which focus more specifically on *order processing speed.*

5.2.15 Ease of Authorisation

In most organisations requisitions above a certain value must be authorised before being sent to a supplier. The ease and speed of this process may have significant implications for *Perceived EPQ.* To ensure a smooth order process, a small pool of authorisers is usually set up to approve order requisitions. However, if these individuals find it difficult to complete their task, there is the temptation to allow others to in the pool to approve orders. At worst, no one authorises a requisition and delays ensue. In some cases, self-authorisation for any order is prohibited whilst in others all users have quite high limits (e.g. Max £2000). This obviously has significant implications for order processing, budget tracking and ensuring appropriate spending. There is usually a trade-off between control and speed.

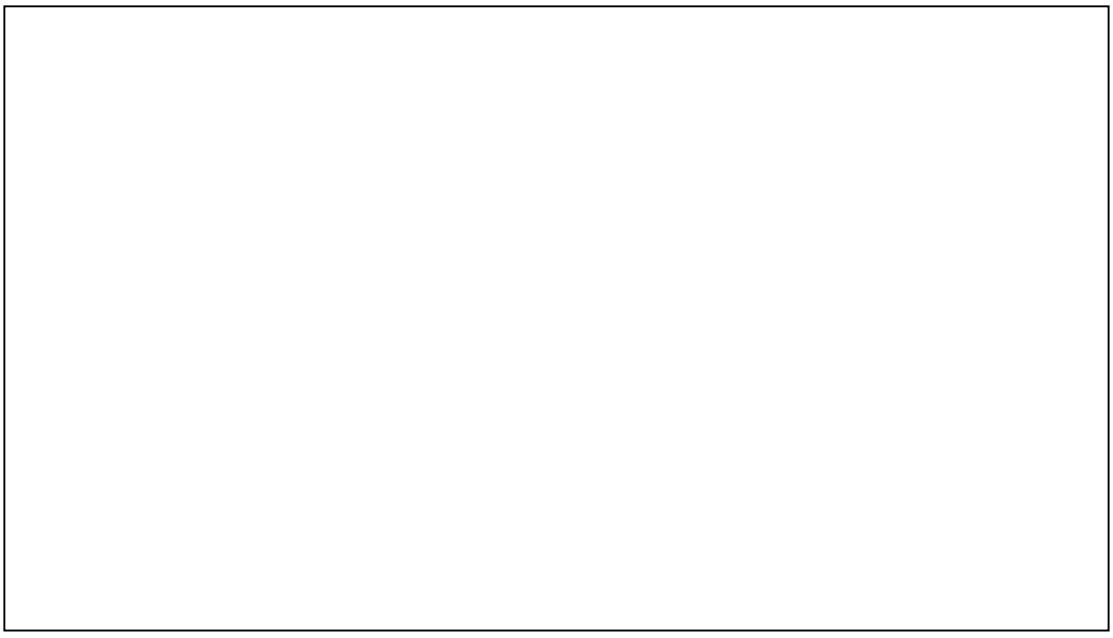
Whilst the overall efficiency of the order process is included in a number of *E-SQ* measurement scales (cf. Yoo & Donthu, 2001; Trocchia & Janda, 2003; Voss, 2003; Yang *et al.* 2003; Bansal *et al.* 2004; Lim & Dubinsky, 2004), the literature review did not identify any specific reference to *Ease of Authorisation.* In the case of e-service, authorisation is not applicable, because end-consumers do not require approval to place an order. The variable is only applicable to an internal customer setting, where the requisition may not originate from the budget holder.

.2: The main advantage that I have found is the fact that you have done away with the postage ime. How ever urgent an order was in the past the order had to be typed and posted – via an nternal post room. So if you're dealing with a large firm you know that the opposite happens at he other end – it goes into their post room and is slow. With the electronic system it goes from me o my colleague who authorises it, to IDeA and to the supplier. I've done it – I've raised an order nd had the colleague confirm it and the supplier has gone and the supplier has said, 'about his e-mail you've sent me'.

.7: I have placed an order with a new supplier placed the order that was all fine and it got pproved by my manager and it was sent off. Now a week later I had not heard anything from the upplier. And had not received the goods I ordered. There is nothing compulsory on the Market lace system for the supplier to say they have received your order. They can do it but they have to og into the system themselves and do that so it is only if the supplier really feels that they want to an they do that. So in the end I have had to chase up the supplier. Only to find out that they have not received the order now there s nothing on the market place of course if there was something on the system to say that this upplier has confirmed receipt and if they did it in 24 or 48 hours.that they had received it then all s great but if I have not heard anything from then of course I can chase them up but as it is not ompulsory it is not unusual to see that they have not actually accepted the order.

5.2.16 Orders to Suppliers

The speed and reliability of getting orders to suppliers ultimately affects order cycle-time and hence *Perceived EPQ*. Initially, this may be viewed as part of order processing, but unlike other elements of processing that are influenced by how individuals use the system, this variable considers the speed of getting requisitions to suppliers *post-authorisation*. One obvious benefit of e-procurement is the fact that once approved, orders can be sent instantaneously to suppliers. This is clearly an improvement on sending orders in the post or via fax. However, there are challenges in ensuring requisitions are delivered to suppliers in a timely and reliable manner. In addition to the system notifying internal customers that a requisition has been delivered, organisations must ensure that suppliers have the infrastructure and training to receive process orders electronically.



As with *ease of authorisation*, the literature review failed to identify any variables in measurement scales that specifically address the speed and reliability with which requisitions are delivered to suppliers. Whilst *order cycle-time* (cf. Cavinato, 1987; Hendrick & Ruch, 1988; Rossler & Hirsz, 1996) is broadly applicable, it lacks the specificity appropriate to *Perceived EPQ* measurement. Unlike e-service, where end-consumer tends to access a supplier site directly and place an order, e-procurement users essentially have a 'middle man' – the e-procurement system provider – that distributes orders after internal authorisation.

.3: Orders take ages to get through the system. I don't know if it's the suppliers getting slower, or the
hat the electronic system is a waste of time and they'd be less shocked of a 'cock-up' when they
elivery it, because it's all been entered electronically – there's no double entry.
.12: If an order arrives on time, we praise the supplier. If it's late we blame the system. It's not
ght. Orders take longer now – they shouldn't! The trouble is that we don't know if they got it, so
e're hanging around waiting for an order that they [supplier] might not have.

5.2.17 Order Lead-Time

Order Lead-Time considers the impact of e-procurement on the time it takes to get an order delivered. As such it relates closely to *order processing speed, ease of authorisation,* and *orders to suppliers.* If e-procurement users believe that the overall lead-time for orders has improved as a result of system adoption, *Perceived EPQ* is likely to be positively affected. Whilst lead-time may be influenced by the implementation of e-procurement, much of the time it takes to receive orders is down to individual suppliers.

Order Lead-Time is found widely in the literature, because it is important to internal and external customers alike. Within procurement work, Cavinato (1987) applies the term *'order speed'*, Hendrick and Ruch (1988) *'the ability to control purchase order cycle time'*, and Rossler and Hirsz (1996) broadly within *service*. Within *E-SQ* literature, *order lead-time* is addressed by Voss (2003) who essentially combines *speed* and *reliability* variables within *fulfilment and delivery.* Bansal *et al.* (2004) apply a similarly broad term – *'shipping and handling'* – to cover order fulfilment, including delivery options, receipt of product and timeliness. More specifically, Yang *et al.* (2003) apply the term *'prompt delivery'* and note the ability of this variable to both satisfy and dissatisfy (cf. Johnston, 1995, 1997).

5.2.18 On-Time Delivery

On-Time Delivery is clearly important to individuals whether they are using e-procurement or not. Whilst, suppliers are largely responsible for the percentage of on-time deliveries, it can still affect *Perceived EPQ.*

16. Since adopting e-procurement I'm sure we've had an improvement in accuracy of the orders coming in. I guess there's less chance of a mistake because once it's on the system it won't be re-typed.

The ability to ensure that orders arrive as promised is examined extensively within the literature (cf. Cavinato, 1987; Hendrick & Ruch, 1988; Silvestro & Johnston, 1992; Stanley & Wisner, 1998, 2002; Barnes & Vidgen, 2002; Lociancono *et al.* 2000, 2002; Yang & Jun, 2002; Yang *et al.* 2003; Bansal *et al.* 2004; Lim & Dubinsky, 2004; Long & McMellon, 2004). Cavinato (1987) applies the term *'reliability'*, Henrick and Ruch (1988) use *'making purchases that arrive on time'*, whilst the *SERVQUAL* scale (Parasuaman *et al.* 1988) includes *'XYZ Co. provides its services at the time it promises to do so.'* Stanley and Wisner (1998, 2002) use *'on-time delivery of products/services'*, whilst Barnes and Vidgen (2000, 2001a, 2001b, 2002) explore the feeling of *'confidence that goods/service will be delivered as promised'*. Lim and Dubinsky (2004) address *'timely delivery'* in their *convenience* factor, whilst Long and McMellon's item – *'when a retail Internet promises to do something by a certain time, they should do it'* – relates to both *on-time delivery* here and *reliability* within e-procurement support.

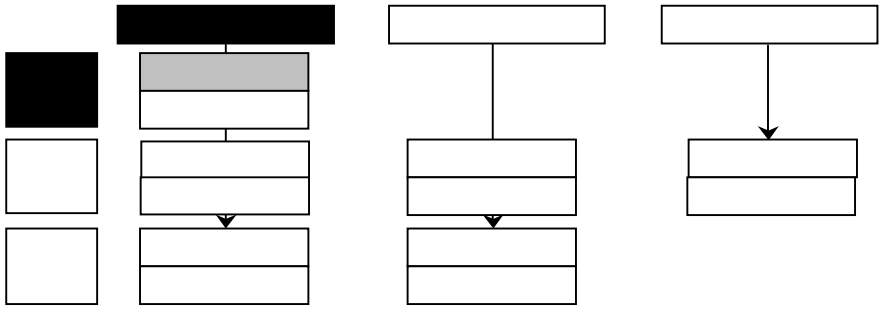
5.2.19 Order Accuracy

Traditional procurement differs to e-procurement in that there may be several points where data is re-entered onto systems, creating potential for inaccuracy. In much the same way as *on-time delivery*, this variable is strongly influenced by supplier competence and yet may have a significant impact on *Perceived EPQ*.

Cavinato (1987) refers to order accuracy as *'reliability',* whilst Hendrick and Ruch (1988) consider the importance of *'making purchases that pass incoming quality assessment inspecting'*. Parasuraman *et al.* (1988, 1990) use the term *'XYZ Co. performs the service right first time'* to address accuracy of service delivery. Wolfingbarger and Gilly (2003) use items *'you get what you ordered from this website'* and *'the product that came was represented accurately by the website'* to describe order accuracy. Yang and Jun (2002) use *'the quality and quantity of the product/service I received was exactly the same as that I ordered'*. In addition, Trocchia and Janda (2003), Voss (2003), Yang *et al.* (2003), Long and McMellon

(2004) and Bansal *et al.* (2004) also consider *order accuracy* in their measurement scales.

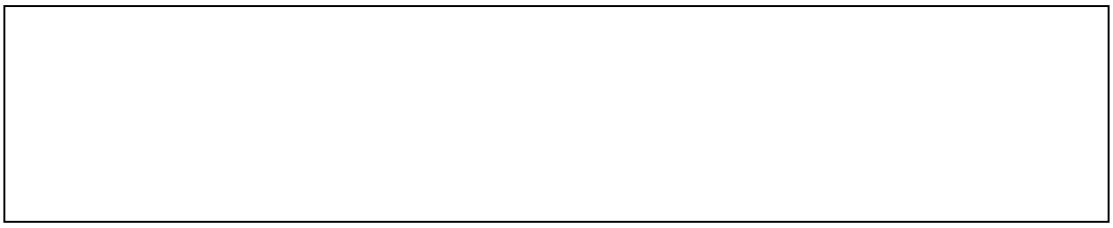
5.3 Proposed Components of Perceived EPQ – Support



The last 14 proposed components of *Perceived EPQ* appear to be more concerned with the provision of *support* for internal customers who use e-procurement. These components are now discussed in detail. At then end of the section, a summary of relationships between all 33 variables and antecedent literature is provided.

5.3.1 Support Availability

When internal customers of e-procurement encounter difficulties, it is important that there is support available to them. Whilst one point of call is often desirable from an internal customer perspective, those delivering e-procurement need the resources and flexibility to provide sufficient support to their users. This is a particular challenge for small organisations, where e-procurement support may comprise of one or two staff.



Availability is discussed widely in the literature (cf. Grönroos, 1984, 1988; Parasuraman *et al.* 1985, 1988, 1991, 1994; Johnston *et al.* 1990; McDermott & Emerson, 1991; Rands & Cumberbatch, 1993; Finn *et al.* 1996, Van Dyke *et al.* 1997, 1999; White & Ruddell, 1999; Zhu *et al.* 2002; Bruhn, 2003; Gounaris & Dimitriadis, 2003). According to Grönroos (1988), one of the six criteria of good perceived service quality is *'accessibility and flexibility'*. Whilst this variable deals with both the

availability of staff, it also examines location and operating hours. Location is not applicable to e-procurement, as it is a system, whilst operating hours would be more linked to *system availability*. Parasuraman and his colleagues incorporate *support availability* in the *SERVQUAL* scale – *'Employees of XYZ Co. are always willing to help you'* and *'Employees of XYZ Co. are never too busy to respond to your requests'*. Replications of *SERVQUAL* in an *E-SQ, ISQ,* and *Information Systems Quality* have all applied similar items.

5.3.2 Support Reliability

When a query cannot be answered immediately, it is important that support personnel provide an indication of how long things will take and get back to internal customers as promised. The reliability of support may strongly influence *Perceived EPQ.*

As with *support availability,* this variable is applied to many service measurement scales. Parasuraman *et al.* (1990) use the item *'When XYZ Co. promises to do something by a certain time, it does so.'* Johnston (1995) includes *'reliability'* in his 18 service quality factors. However, in addition to *'keeping arrangements made with customers',* the factor also includes *'punctual service delivery'*. This second element is more relevant to *on-time delivery* in an e-procurement context. Combining *SERVQUAL* and *USISF* measures, Kettinger and Lee (1994) use the item; *'employees in our college's computing services tell you exactly when services will be performed.'* More recently, much of the *E-SQ* literature has identified *support reliability* as an important measurement variable (cf. Yang & Jun, 2002; Zhu *et al.* 2003; Yang *et al.* 2003; Bansal *et al.* 2004; Long & McMellon, 2004).

5.3.3 Support Responsiveness

The speed of response to queries may be an important driver of *Perceived EPQ.* If queries need additional clarification (e.g. with e-procurement providers outside of the organisation), users expect some delay. However, this needs to be limited to ensure satisfaction is maintained.

I.8: I could not fault Stephanie [E-Procurement Support]. When we had a problem we phoned er up and she came straight down and it was that one-to-one training that you needed.

I.1: We have the people here – the support has the knowledge, so if we ask them a question do they ctually seem to know the answer.

I.23: I e-mail her and the E-mails back, she is usually quite quick.

I.6: There is nothing more frustrating than ringing somebody who does not know what they are alking about. Pretty much any question I get asked I can give them an answer to.

I.24: People want to talk to somebody quickly who knows what they are talking about, rather than eing passed around.

Responsiveness is discussed by a number of the early service quality writers (cf. Grönroos, 1988; Parasuraman *et al.* 1988; Johnston, 1990, 1995 Silvestro & Johnston, 1992; Rands & Cumberbatch, 1993). For example, Johnston (1995) includes *'prompt responsive to customer requests'* in his *responsiveness* factor. Within *Information Systems Quality* literature, those incorporating service quality in their scales have considered *support responsiveness* (cf. Kettinger & Lee, 1994, 1997, 1999; Pitt *et al.* 1995, 1997; Myers *et al.* 1997). The variable is also used extensively in *ISQ* (cf. Cavinato, 1987; Hendrick & Ruch, 1988; Young & Varble, 1997; Kuei, 1999; Stanley & Wisner, 1998) and *E-SQ* work (cf. Wolfinbarger & Gilly, 2001, 2003; Yang & Jun, 2002; Zhu *et al.* 2002).

5.3.4 Knowledge

Knowledge refers to the technical competence of support staff to deal with problems experienced by e-procurement users. Having individuals with a high level of knowledge about an e-procurement system is critical, especially in light of system updates and improvements. For complex problems, support staff need rapid access to advanced support (often from outside of the organisation).

Within the literature, Grönroos (1988) discusses the importance of having employees, with the knowledge and skills required to solve problems. Aspects of this variable are incorporated in Johnston's (1995) *competence* factor, which is also applied by Croom and Johnston (2003) when examining *ISQ* in an e-procurement context. Reynoso and Moores' (1995) *professionalism* factor includes *'the skills, knowledge and experience*

required to provide service and to give advice'. Cavinato (1987) broadly talks about *assistance* as part of the *output of purchasing*, whilst Hendrick and Ruch (1988) consider the knowledge of commodities within the buyer's area of responsibility as an important performance criterion. Rossler and Hirsz (1996) apply the term *technical knowledge* as one aspect of customer-orientated purchasing performance. Based on items from Goebel *et al.* (2003), one of the measures of internal service used by Fredendall *et al.* (2005) concerns the technical ability to answer internal customer queries. Others to apply the concept to *ISQ* include Finn *et al.* (1996), Caruana and Pitt, (1997), and Auty and Long (1999). Within *E-SQ*, the term is applied less frequently (cf. Voss, 2003; Yang *et al.* 2003; Bansal *et al.* 2004; Long & McMellon, 2004), whilst only Bailey and Pearson specifically examine knowledge in the *Information Systems Quality* literature, using the term *'competence'*.

5.3.5 Talking User's Language

In the case of complex information systems, those providing support may find it hard to appreciate the level of understanding which users possess. Given that individuals may feel embarrassed to seek clarification, the ability to provide explanations to queries in a manner that is easy to understand may be important.

Few authors consider *talking users' language* directly, though it may be seen as an aspect of *empathy*, *professionalism*, *attitude*, or *care.* For example, the *SERVQUAL* scale has the item *'employees of XYZ Co. understand your specific needs'*, whilst Johnston (1995) considers *'the ability of the service providers to communicate in a way he or she will understand'*. Considering website quality, Lederer *et al.* (2000) address *ease of understanding*, with *'items graphics and terms that are both consistent and understandable'*. Yang *et al.* (2003) use *'clear answers/instructions'* within their *communications* dimension when developing a scale for Internet retail service quality.

5.3.6 Support Flexibility

Support flexibility refers the willingness to meet the various demands of e-procurement users. This may involve getting an order rushed through the system late on a Friday afternoon, or a willingness to deal with a supplier who is not yet approved. However, flexibility can goes both ways. Perceived inflexibility from a procurement department may be seen as perfectly justifiable from an organisational perspective. The view that *'rules are there for a reason'* is contrasted with the view that *'rules are for the guidance of wise men and the obedience of fools!'*

The *SERVQUAL* scale incorporates *support flexibility*, as do some of its many replications in *Information Systems Quality* (cf. Pitt *et al.* 1995, 1997, 1999; Kettinger and Lee, 1994; Van Dyke *et al.* 1997, 1999; Jiang *et al.* 2002) and *E-SQ* literatures (cf. Wolfinbarger & Gilly, 2001, 2003; Zhu *et al.* 2002; Li *et al.* 2003; Long & McMellon, 2004).

5.3.7 Problem Resolution

Problem resolution refers to the ability of e-procurement support to resolve problems that arise during e-procurement use.

In presenting the notion of the 'internal service encounter', Gremler *et al.* (1994) explore the employee response to service delivery system failures. They note the importance of recovery, especially when the fault lies with the service provider. Chaston (1994, 1995) examines the ability to solve problems in his typology for

evaluating perceptions of internal customer management processes in U.K. clearing banks. Finn *et al.* (1996) have an item *'help you solve unique problems that are not covered by stated procedures'*. Other *ISQ* measures examine problem resolution in their scales (cf. Cavinato, 1987; Rossler & Hirsz, 1996; Caruana & Pitt, 1997; Young & Varble, 1997; Croom & Johnston, 2003; Kang *et al.* 2003). The variable is also applied to in *Information Systems Quality* (cf. Kettinger & Lee, 1994; Kettinger *et al.* 1997, 1999; Pitt *et al.* 1995, 1997; Jiang *et al.* 2000, 2002) and *E-SQ* literature (cf. Liu & Arnett, 2000; Zeithaml *et al.* 2000; Yang *et al.* 2003).

5.3.8 Confidentiality

E-procurement users should feel able to discuss problems with support staff with the confidence that such communications will be treated with appropriate levels of discretion. Some users have little worries about the level of confidentiality, whilst others may treat any dealings with support staff as strictly private.

Reynoso and Moores (1995) define confidentiality as *'the unit's handling of confidential information or delicate situations'*. Johnston (1995) explores confidentiality as *'the honesty, justice, fairness and trust with which customers are treated by the service organisation'* in his *integrity* factor. *E-SQ* literature often relates *confidentiality* to *security / privacy* of information on systems. For example, Barnes and Vidgen (2002) have an item *'my personal information feels secure'*, Liu and Arnett (2000) use *'keep confidential customer information'*, Whilst Wolfinbarger and Gilly (2003) use *'I feel like my privacy is protected at this website'*. Loiacono *et al.* (2000, 2002) have two items relating to confidentiality in their *trust* construct – *'I trust the website to keep my personal information safe'* and *'I trust the website administrators will not misuse my personal information'*. Whilst confidentiality does consider privacy of information online, the variable is more related to dealings with e-procurement support. This is because high levels of online privacy are not always appropriate to e-procurement contexts.

.5: You get the feeling that when you had a query that it was all still friendly.
.8: There are some people who have a lot of problems and get to be a bit 'moany'. I want to do h and I can't. Yes well you should not be able to so you are not going to get it. I do tend to deal ith them quite quickly.
123: In the training there was an element of encouraging people. She [the trainer] was very riendly.
.1: You have to treat everybody as an individual.

5.3.9 Friendliness

For some e-procurement users it may be enough for support staff to answer a query efficiently and accurately, but others expect a certain level of friendliness in their dealings.

Friendliness is used widely in the literature to measure the less tangible elements of service (cf. Grönroos, 1984; Parasuraman *et al.* 1988; Baroudi & Oilikowski, 1988; Johnston & Silvestro, 1990; Finn *et al.* 1996; Lings & Brooks, 1998; White & Ruddell, 1999; Croom & Johnston, 2003). Whilst definitions and item-wording varies within the literature, the definition of friendliness given by Johnston and Silvestro (1992) seems a good one– *'the warmth and personal approachability (rather than physical approachability) of the service providers, particularly contact staff, including cheerful attitude and the ability to make the customer feel welcome'*.

5.3.10 Concern Shown

There are times when requests from users cannot be granted (e.g. approving a new supplier when a contract already exists). However, the willingness to listen and empathise is critical, even when the answer is no. Users are more likely to raise problems, which can then be dealt with, if they believe that the support staff care.

Grönroos (1988) defines *attitudes and behaviour* as *'the customers feel that the contact persons are concerned about them and are genuinely interested in solving their problems in a friendly and spontaneous way'.* This factor incorporates *concern*, but also *friendliness*, *support responsiveness*, and even *problem resolution.* Johnston (1995) considers issues of *concern* in both *attentiveness / helpfulness* and *care* factors. Concern includes giving *'the impression of interest in the customer and showing and willingness to serve'* as well as *'the concern, consideration, sympathy and patience*

.10: If you are getting some training after you have used it a little bit you know what the problems re and then you are able to answer those queries in the training.

.21: It would be better if you said 'You are going live on the 7th April. I'm going to come up and 'll train four people on the 7th April. Then I'll come up and I'll train another four on the 8th'. As : was, there was a huge gap!

shown to the customer'. Finn *et al.* (1996) use an item *'give you the feeling that you are an important customer'* when measuring *concern. Concern Shown* is also found in a limited set of *E-SQ* studies (cf. Wolfinbarger & Gilly, 2003; Yang & Jun, 2002; Lim & Dubinsky, 2004).

5.3.11 Timely Training

:8. Users have had training and they get a user manual but the user manual is about seventy ages long and they are not going to sit down and read it.

.8: They're using then, they actually have an order, it's something they want, it's not a made up tem. And that's the best way, that's why it was a lot better when Steph came up.

.18: There is no reason why we could not go to someone's desk and do it with them but then you re doing a one on one or a one on two. When we do training we can do ten people in one go. So here is a resource issue there.

Timely Training focuses on when users are given training to use an e-procurement system. In some cases, the delay between training and going live on the system can create serious problems. Even if training has been thorough, users may forget what they have been taught if they do not start using the system soon after their training. In addition, the system itself is likely to be updated every 6-12 months, so training can quickly become out-dated.

5.3.12 Appropriate Training

Approach to Training considers the availability of training, the length and content, the use of electronic resources, 'cascade training', provision of appropriate manuals, the appropriate ratio of trainers to users, and the availability of re-training or advanced training. People's expectations clearly vary depending on individual attitudes and skills. Some are happy to train on a 'dummy system', while others prefer to wait until they have a real order on a live system. A one-to-one approach may be desirable from a user perspective, but stretches the resources of e-procurement support services. Training 'super-users' to cascade train others may be desirable from a service provider perspective, but has the possibility to create 'Chinese whispers' in information delivery.

Training is not generally split between *timing* and *approach* in the literature reviewed, but remains a generic term which is applied to surprisingly few measurement scales in the literature used in the study. Kettinger *et al.* (1995) include *'degree of training provided to students by our college's computing services'* as part of a modified version of the *UIS* scale (Baroudi and Oilikowski, 1988). Lewis and Gabrielson (1998) examine the role of training in their study of intra-organisational aspects of service quality management. The authors examine various issues, including the *amount*, *frequency* and *value* of training. Hallowell *et al.* (1996) use *effective training* as one component of *ISQ*, asking *'is effective, useful, job-specific training made available in a timely fashion?'* Fierens (1997) discusses the importance of training as part of developing internal customer focus. Croom & Johnston (2003) list *training* as an element of *people* in their conceptual model of internal service delivery. Finally, Voss (2003) provides an example of *value-added service* as web-based course rooms to support in-company training courses.

5.3.13 Information Provision

E-procurement users expect to be kept up-to-date with changes to specification brought about by system releases. In addition, any new catalogues, suppliers, procurement rules, or tips for use should be delivered to users. Newsletters, e-mails, Intranet posts, magazines, and cascade communications are all methods of delivering information to users. Which approaches are more appropriate will vary between organisations.

Information provision is covered extensively in the literature. The *SERVQUAL* scale has one item – *'materials associated with the service are visually appealing at XYZ Co.'* – that partially alludes to how information is delivered. However, beyond this, the variable is not examined in detail. Johnston (1995) discusses the *'clarity,*

completeness and accuracy of both verbal and written information' as part of his *communication* factor. Finn *et al.* (1996) address the importance of people in purchasing being a source of information to internal customers. Within *Information Systems Quality* literature, authors often sub-divide the variable addressing the extent to which information is accurate, clear, complete, trustworthy, on-time, important, relevant, usable, concise, or free from bias (cf. Bailey & Pearson, 1983; Doll *et al.* 1998; Baroudi & Oilikowski, 1988; Davis, 1989; DeLone & McLean, 1992; Kettinger *et al.* 1994, 1997, 1999). For example, Kettinger *et al.* (1994) have four items within their *information product* factor that relate to information provision – *reliability*, *relevancy*, *accuracy*, and *precision.* This splitting of information also occurs in some *E-SQ* measures (cf. Liu & Arnett, 2000; Barnes & Vidgen, 2002). For example, Barnes and Vidgen (2002) have seven items asking if information is *accurate, believable, timely, relevant, easy to understand, at the right level,* and *in the right format.* Li *et al.* (2003) replace the *tangibles* dimension of the original *SERVQUAL* scale with a dimension termed *quality of information*, with items considering the *timeliness*, *accuracy and relevance*, *richness*, and *language* used. Others authors stick to a single information variable (cf. Wolfinbarger & Gilly, 2001, 2003; Yang & Jun, 2002; Yang *et al.* 2003). With the *EPQ Scale*, it was decided to apply a single variable to this issue. This was partly through consideration of interview anecdotes and the aim of model parsimony.

5.3.14 Encouraging Feedback

Whilst *information provision* refers to the delivery of useful information from service providers to internal customers, *Encouraging Feedback* is more concerned with a *two-way flow* of information. In many organisations, operational users often feel they have limited influence in how a system is developed. However, if e-procurement service providers listen to those who use the system on a day-to-day basis, the potential for appropriate improvements may be increased.

The importance of encouraging feedback is most widely discussed in the *ISQ* literature (cf. Lewis & Gabrielson, 1995, 1998; Reynoso & Moores, 1995, 1997; Yavas, 1995a&b; Hallowell *et al.* 1996; Fierens, 1997; Brooks *et al.* 1999; Gilbert, 2000). Fierens (1997) explains the importance of *'formalised feedback systems'* in ensuring internal customer focus, whilst Gilbert (2000) considers the item *'treats me as a partner'* as an element of *personal service*. In addition, a limited number of authors also apply this variable to *E-SQ* scales (cf. Yang & Jun, 2002; Yang *et al.* 2003; Lim & Dubinsky, 2004; Long & McMellon, 2004). For example, Lim and Dubinsky (2004) address *'customer comment and feedback'* in their *interactivity* factor, whilst Long and McMellon (2004) have an item *'retail Internet sites should have customer feedback mechanisms'*.

5.3.15 Conclusion on Selective *EPQ* Codes

Table 25 illustrates how the proposed selective *EPQ* codes relate to the reviewed literature. Crosses indicate where authors have used the same or a similar item in measurement scales, whilst '/' indicates allusion to a variable at a higher level of abstraction. For example, *functionality* may allude to *FMS integration*, *invoice reconciliation*, *system configurability*, and *reporting* without specifically addressing these variables. At the bottom of the table is an indication of the extent to which each component is addressed in both the literature and empirical data. This information is useful in giving the reader a sense of from where different variables originate. One can see that in some variables are largely extracted from the literature, whilst others are based more on empirical data. Some are mentioned very often or extensively in both the literature and interview transcripts. Having presented the proposed components of *Perceived EPQ*, the next section presents analysis of component validation with a view to proposing a measure of the construct.

Table 25. *Perceived EPQ* Variables & Their Relationship with Antecedent Literature

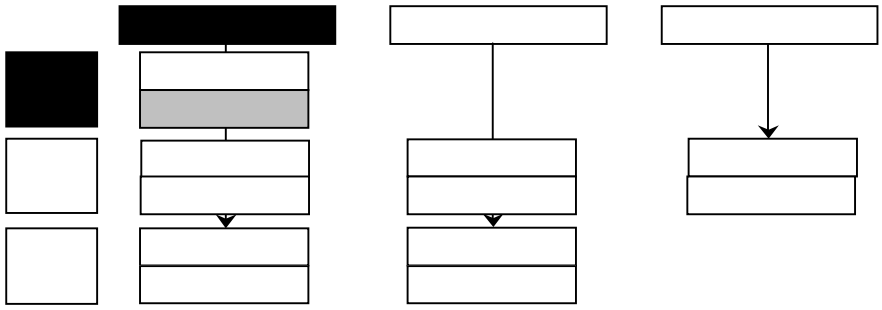
References ⬇ / Selective Codes (*Phase 2*) ➡	FMS Integration	Invoice Reconciliation	System Configurability	Reporting Capability	Processing Complex Orders	System Security	System Availability	Screen Loading	System Navigation	Visual Appeal	Loaded Suppliers	Loaded Catalogues	Ease of Search	Order Processing	Ease of Authorisation	Orders to Suppliers	Order Lead-time	On-Time Delivery	Order Accuracy	Support Availability	Support Reliability	Support Responsiveness	Knowledge	Support Flexibility	Problem Resolution	Confidentiality	Friendliness	Concern Shown	Talking Users' Language	Timely Training	Appropriate Training	Information Provision	Encouraging Feedback
Bailey & Pearson '83	x		x				x	x		x												x	x				x	x				x	
Grönroos '84, '90																				x	x	x	x	x	x		x	x					
Cavinato '87														x			x	x	x	x	x	x	x	x	x	/	/					x	
Baroudi & Oilikowski '88																											x	x		x	x	x	x
Hendrick & Ruch '88					x									x			x	x	x			x	x									x	
Doll & Torkzadeh '88, '91, '99				x					x		/	/																				x	
Parasuraman *et al.* '88, '91, '94																		/	/	x	x	x	/		x	/	x	x				/	
Davis '89							x		x																							x	
McDermott & Emerson '91																				x	x	x		x	x			x	/			x	
Cronin & Taylor '92, '94																		/	/	x	x	x	/		x	/	x	x				/	
DeLone & McLean '92 '03			x				x	x	x																							x	
Rands & Cumberbatch '93																		/	/	x	x	x	/		x	/	x	x				/	
Chaston '94, '95																				x	x	x			x	/	x	x				/	
Gremler *et al.* '94																				x		x	/	x	x		/	/					
Kettinger & Lee '94 '97 '99	x		x				x	x	/											x	x	x		x	x	/	x	x	x	/	/	x	x
Kettinger *et al.* '95	x		x				x	x	/											x	x	x		x	x	/	x	x	x	/	/	x	x
Boshoff & Mells '95																					x	x	x	x	x		x	x				x	
Johnston '95									/	/										x	x	x	x	x	/	x	x	x	/			x	/
Lewis & Gabrielson '95, '98																				x				x	x		/	/		/	/	x	x
Lewisohn & Reynoso '95							/													x	x		x	x				x					
Pitt *et al.* '95, '97, '99																				x	x	x		x	x	/	x	x				x	
Reynoso & Moores '95, '97																				x	x	x	x	x	x	x	x	x				x	x
Finn *et al.* '96														x		/	x		x	x	x	x	x	x	x		x	x				x	
Hallowell *et al.* '96																				x					x					/	/	x	
Rosler & Hirsz '96																	x	x	x			x	x	x				x				x	x
Caruana & Pitt '97																				x	x	x	x	x	x	x	x					x	
Fierens '97																							x				x	x		/	/	x	x
Hill & McCrory '97																						x	x	x		x		x				x	
Myers *et al.* '97				x			x		/											x	x	x		x	x	/	x	x				x	
Rice '97								x	x	/	/	/	x																				
Van Dyke *et al.* '97, '99																				x	x	x		x	x	/	x	x				x	
Young & Varble '97																				x	x	x		x	x	x	x	x					
Jayasuria '98																				x		x		x	x		/	/	x			x	
Lings & Brook '98							/													x	x	x	x				x	x				x	x
Stanley & Wisner '98, '99, '02																		x			x	x		x				x				x	
Watson *et al.* 98							x														x	x		x	x	/	x	x		/	/	x	x
Auty & Long '99							/													x	x	x	x	x	x	x	x	x				x	
Chen '99										x																						x	

Continued…

References ⬇ / Selective Codes (*Phase 2*) ➡	FMS Integration	Invoice Reconciliation	System Configurability	Reporting Capability	Processing Complex Orders	System Security	System Availability	Screen Loading	System Navigation	Visual Appeal	Loaded Suppliers	Loaded Catalogues	Ease of Search	Order Processing	Ease of Authorisation	Orders to Suppliers	Order Lead-time	On-Time Delivery	Order Accuracy	Support Availability	Support Reliability	Support Responsiveness	Knowledge	Support Flexibility	Problem Resolution	Confidentiality	Friendliness	Concern Shown	Talking Users' Language	Timely Training	Appropriate Training	Information Provision	Encouraging Feedback
Kuei '99							x													x	x	x	x	x	x	x	x	x				
White & Ruddell '99							/													x	x	x	x	x	x	x	x	x				x	
Barnes & Vidgen '00, '01a+b '02			x				x		x	x								x	x							x						x	
Frost & Kumar '00, '01							/													x	x	x	x	x	x	x	x	x					
Gilbert '00																				x	x	x	x				x	x					x
Jiang *et al.* '00, '02																				x	x	x		x	x	/	x	x				x	
Lederer *et al.* '00									x	x	x																		/			x	
Lin & Lu '00								x	x																							x	
Liu & Arnett '00			x			x	x	x	x	x			x											x	x	x						x	
Lociancono *et al.* '00, '02						x		x	x	x								x								x						x	
Zeithaml *et al.* '00, '02a+b			x			x	x	x	x	x			x	x				x		x		x		x	x	x							
Wolfinbarger & Gilly '01, '03			x			x	x	x	x	x	/	/	x	x				x	x	x		x		x	x	x		x				x	
Yoo & Donthu '01						x			x	x				x																			
Kang *et al.* '02																				x	x	x	x	x	x	x	x	x	/			x	
Koufaris '02									/				x																				
Yang & Jun '02			x			x				x	/	/						x	x	x	x	x				x			/			x x	
Zhu *et al.* '02						x	x	x	x										x	x	x	x		x	x	x		x				x	
Bruhn '03			x				/													x	x	x	x	x			x						
Croom & Johnston '03	x					x	x	/	/								x			x	x	x	x	x	x	x	x	x		/	/	x	
Trocchia & Janda '03						x	x		x	x	/	/		x				x	x						x	x						x	
Voss '03			x				x	x	x				x	x			x	x	x			x	x			x				/	/	x	
Yang *et al.* '03						x	x	x	x	x				x			x	x	x	x	x	x	x	x	x	x	x	x			x	x
Gournaris & Dimitriadis '03						x		x	x	x										x		x				x		x				x	
Somers *et al.* '03				x					/																							x	
Bansal *et al.* '04									x	x	/	/	x	x			x	x	x		x	x	x									x	
Lim & Dubinsky '04						x			x	x	/	x	x	x				x								x						x	x
Long & McMellon '04						x	x	x	x	x			x	x				x	x	x	x	x	x	x	x	x	x	x			/	x	x
Sweeney & Lapp '04								x	x	/			x	x																		x	
Abdinnour-Helm *et al.* '05									/																							x	
Federakli *et al.* '05																		x	x			x	x		x	/		x				x	
BizRate.com									x		/	/					x	x	x			x				x						x	
Gomez.com									/										x		x					x						x	
Literature																																	
Empirical Data																																	

- mentioned rarely
- mentioned reasonably often
- mentioned very often
- mentioned extensively

5.4 Selective EPQ Code Validation



This section uses data from *Phase 2* to examine *Research Question 1*. Having identified a set of selective codes based on two phases of analysis, the next stage is to validate these codes in terms of their ability to measure *Perceived EPQ*. The section begins by providing some descriptive data from *Phase 2* interviews. Subsequently, this data is used to test the reliability and validity of the proposed *EPQ* components.

5.4.1 Descriptive Data from *Phase 2* Interviews

Table 26 provides a summary of descriptive data from *Phase 2* interviews. The raw data on which the table is based can be found in appendix 10. The table shows *Perceived EPQ* for the 29 axial codes used in *Phase 2* interviews. In addition, the responses to a single question regarding overall e-procurement quality (*OEPQ Rating*) are shown. All scores are anchored on a 1-7 Likert scale (1 = *always below my expectations*; 7 = *always exceeds my expectations*).

Nearly all variable averages are above expectations (i.e. >5), suggesting that the majority of users in the three district councils perceive e-procurement quality to be satisfactory or good. *FMS integration* and *ease of search* are the two worst performing variables, with scores of 4.43 and 4.20 respectively. Variables relating to e-procurement support score particularly well (>6.0), with the exception of *training, information provision* and *encouraging feedback.* These three variables average 5.20, indicating the relative lack of satisfaction in the provision of training, support information, and opportunities for feedback to influence future system developments.

The average *EPQ* score for the 35 interviewees falls between 4.52 and 7.38, with a mean of 5.80, which is closely mirrored by the *OEPQ Rating* scores. *System*

compliance is quite high, with respondents indicating nearly 80% of orders are placed through *Marketplace. Contract compliance* is lower, with 34% of all orders placed via a central contract. Therefore, whilst individuals are generally using *Marketplace* to place requisitions, they are not necessarily exploiting the full potential of e-procurement.

Table 26. *Phase 2* Summary Data

VARIABLE / CODE	N	Minimum	Maximum	Mean	Std. Deviation
FMS Integration	35	2.00	7.00	4.43	1.27
Invoice Reconciliation	35	3.00	9.00	5.83	1.50
System Configurability	35	1.00	7.00	5.06	1.39
Reporting Capability	35	3.00	8.00	5.03	.86
Process Complex Orders	35	2.00	9.00	5.14	1.75
System Security	35	2.00	9.00	5.40	1.40
System Availability	35	3.00	9.00	6.31	1.84
Screen Loading	35	3.00	9.00	5.86	1.63
System Navigation	35	2.00	9.00	6.17	2.00
Visual Appeal	35	3.00	9.00	5.83	1.60
Content*	35	2.00	8.00	5.00	1.78
Ease of Search	35	1.00	8.00	4.20	1.89
Order Processing	35	2.00	9.00	5.86	1.61
Ease of Authorisation	35	3.00	9.00	6.06	1.80
Orders to Suppliers	35	5.00	9.00	6.54	1.50
Order Lead-Time	35	4.00	9.00	6.20	1.37
On-Time Delivery	35	4.00	9.00	5.86	1.22
Order Accuracy	35	4.00	9.00	6.11	1.47
Support Availability	35	4.00	9.00	6.49	1.69
Support Reliability	35	5.00	9.00	6.60	1.74
Support Responsiveness	35	4.00	9.00	6.46	1.74
*Knowledge & Skills	35	5.00	9.00	6.66	1.51
Support Flexibility	35	4.00	9.00	6.11	1.62
Problem Resolution	35	4.00	9.00	6.37	1.59
Confidentiality	35	5.00	9.00	6.11	1.59
*Attitudes	35	5.00	9.00	6.86	1.75
*Training	35	2.00	9.00	5.26	1.79
Information Provision	35	3.00	9.00	5.29	1.71
Encouraging Feedback	35	1.00	8.00	5.06	1.75
Average *EPQ*	35	4.52	7.38	5.80	.96
OEPQ Rating (1-9)	35	4.00	8.00	5.80	1.18
System Compliance %	35	40.00	100.00	79.57	15.11
Contract Compliance %	35	10.00	90.00	34.00	20.75

** EPQ variable subsequently split*

5.4.2 Testing the Components of *Perceived EPQ*

The *OEPQ Rating* is important in developing a reliable and valid measure of *Perceived EPQ.* As noted in section 4.5.5, having a separate and independent measure of the construct allows an initial assessment of how well the proposed *EPQ Scale* measures *Perceived EPQ*. A close relationship between two independent measures (*OEPQ Rating* and *EPQ Scale*) provides an indication that one is accurately measuring the phenomena of interest (Parasuraman *et al.* 1988). Where no construct measure exists, this 'dummy criterion' method is a popular approach to in scale development and validation (Parasuraman *et al.* 1988; Pitt *et al.* 1995; Reynoso & Moores, 1995; Finn *et al.* 1996).

Figure 25 shows a scatter plot of average *EPQ* variable scores (Selective codes) against *OEPQ Rating* scores. The plot indicates a strong positive relationship between the two sets of figures and further evidence of this is provided in **table 27**. The strong and significant correlation between the two independent variables gives an early indication of validity for the proposed set of *Perceived EPQ* components and suggests that no critical variables have been omitted.

Figure 25. Scatter plot: Average *EPQ* Variable to *OEPQ Rating*

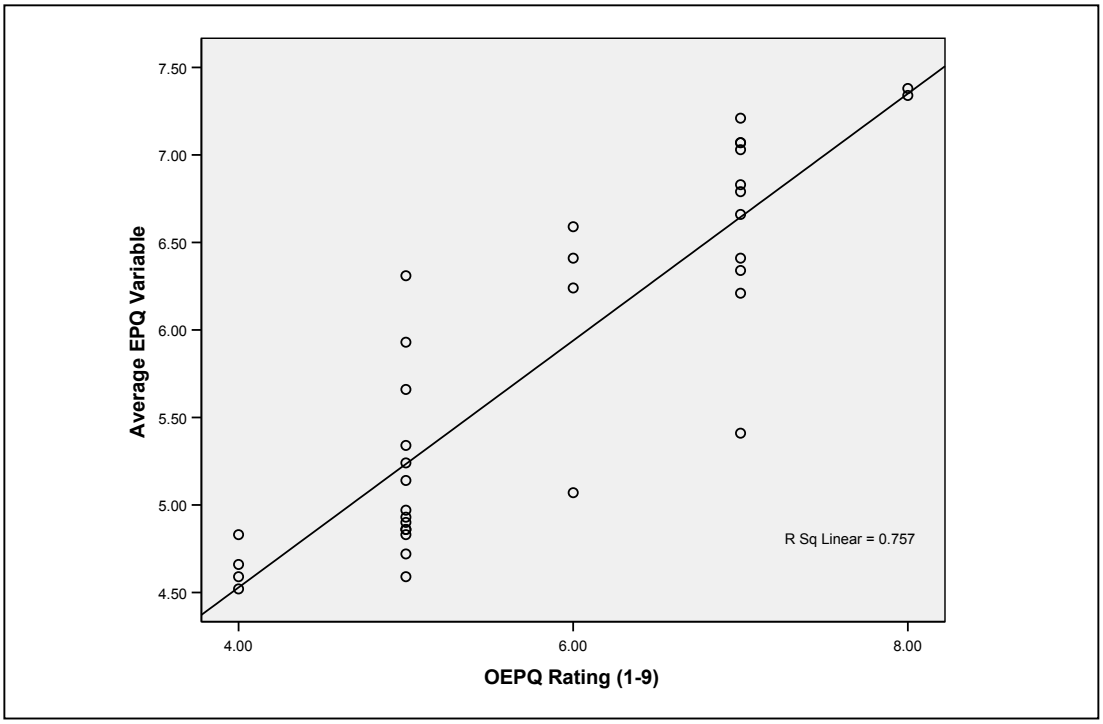


Table 27. Pearson Correlation: *OEPQ Rating* & Average *EPQ* Variable

		***OEPQ Rating* (1-9)**
Average *EPQ*	Pearson Correlation	.870(**)
	Sig. (2-tailed)	.000
	N	35

** Correlation is significant at the 0.01 level (2-tailed).

Additionally, the proposed components are validated by examining the power of scale scores to predict the independent criterion (Flynn *et al.* 1990). Linear regression was carried out to assess the extent to which the average *EPQ* score predicts variance in *OEPQ Rating* **(Table 28)**. For the 35 phase two interviewees, 75% of variance in *OEPQ* was explained by the average *EPQ* score.

Table 28. Linear Regression: Average *EPQ* to *OEPQ Rating*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870(a)	.757	.750	.59164

a Predictors: (Constant), Average *EPQ*

Whilst the average *EPQ* score is a useful 'yardstick' for prediction, a combination of variables may be even more powerful in predicting *OEPQ Ratings.* Therefore regression based on all variables is carried out **(Table 29),** showing an adjusted R^2 of .913. This indicates that a combination of all variable scores predict 91.3% of variance in *OEPQ Ratings*.

Table 29. Linear Regression: All *EPQ* Variables to *OEPQ Rating*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994(a)	.987	.913	.34912

a Predictors: (Constant), All 29 *EPQ* Variables based on phase one interviews

However, it is clear that some variables will have more influence than others in explaining *OEPQ.* Step-wise regression means the variable contributing most to prediction is added first, with others added based on their incremental improvement to the model. **Table 30** shows the best solution with five variables (*system navigation, content, problem resolution, on-time delivery,* and *FMS integration*) that explain 92.7% of variance in *OEPQ Rating* scores. The adjusted R^2 is even higher than with all variables and reflects the value of model parsimony in prediction.

Table 30. Stepwise Regression: All *EPQ* Variables to *OEPQ Rating*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.781(a)	.609	.598	.75062
2	.858(b)	.737	.720	.62601
3	.912(c)	.832	.816	.50809
4	.941(d)	.886	.871	.42552
5	.941(e)	.886	.875	.41876
6	.959(f)	.919	.908	.35843
7	.968(g)	.937	.927	.32039

a Predictors: (Constant), Attitudes
b Predictors: (Constant), Attitudes, System Navigation
c Predictors: (Constant), Attitudes, System Navigation, Content
d Predictors: (Constant), Attitudes, System Navigation, Content, Problem Resolution
e Predictors: (Constant), System Navigation, Content, Problem Resolution
f Predictors: (Constant), System Navigation, Content, Problem Resolution, On-Time Delivery
g Predictors: (Constant), System Navigation, Content, Problem Resolution, On-Time Delivery, FMS Integration

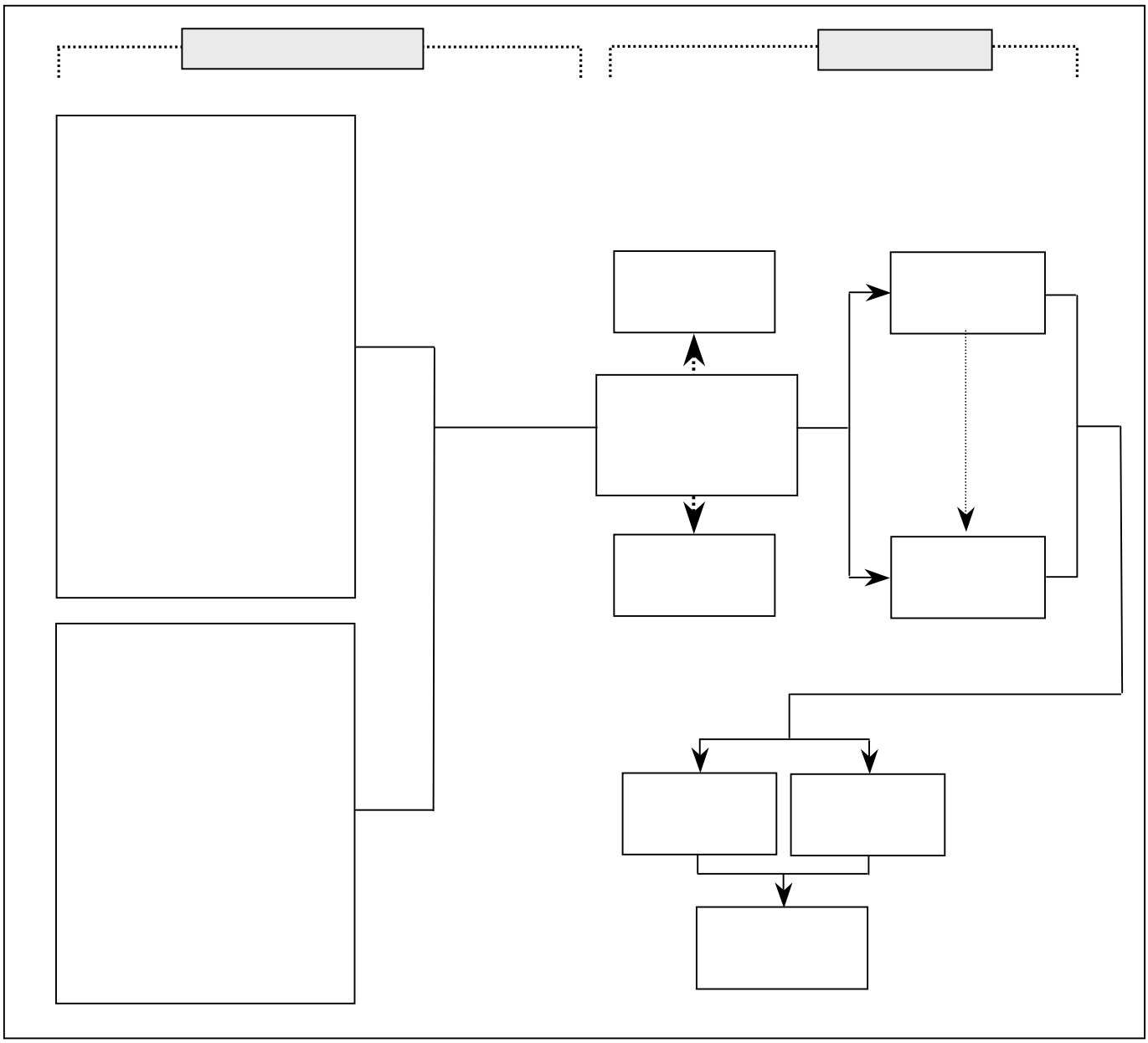
The data analysis provides initial evidence for the reliability and validity of the *Perceived EPQ* components. The fact that two independent measures of the construct are highly correlated, and that data enables accurate prediction of *OEPQ Ratings,* are both indications of the potential value of the components. As noted in the introduction to this section, the analysis based on interview data is undertaken to gain a sense of the likely value of the proposed variables. Only after *Phase 3* analysis can one make more confident claims regarding the reliability and validity of these variables in measuring *Perceived EPQ.*

Summary

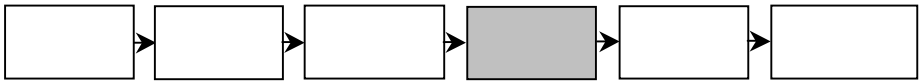
This chapter illustrates the progression by which broad ideas from the literature have been explored and refined through two phases of interviews. *Phase 1* interviews have been instrumental in delineating *Perceived EPQ*, whilst axial coding has helped to identify a more usable set of variables for further work. Additional interviews in *Phase 2* have allowed the refinement codes and produced a set of selective codes. These codes have been examined in detail and their relationship with antecedent literature examined. Finally, the proposed set of components has been tested based on descriptive data from *Phase 2* interviews. This analysis indicates that the set of variables appears to be a useful measure of *Perceived EPQ.* Based on this analysis, a measure of *Perceived EPQ* is proposed – the *EPQ Scale.* This scale incorporates the 33 selective codes derived from *Phase 1* and *2* empirical analysis. **Figure 26** shows

how the proposed scale fits within the broader *EPQ Model.* The model incorporates work from the literature (See figures 5, 6, 7 and 10) with empirical analysis from *Phase 1* and *2.* Beyond the two broad sub-sets of 'system' and 'support', the researcher does not make assumptions regarding the underlying structure of *Perceived EPQ* at this point of the study. The next chapter presents empirical data analysis from *Phase 3* of the study. This work focuses on examining the structure of *Perceived EPQ,* validating the proposed *EPQ Scale*, and comparing two construct operationalisations.

Figure 26. ***EPQ Model*** **(Post-** ***Phase 1 & 2*** **Analysis)**

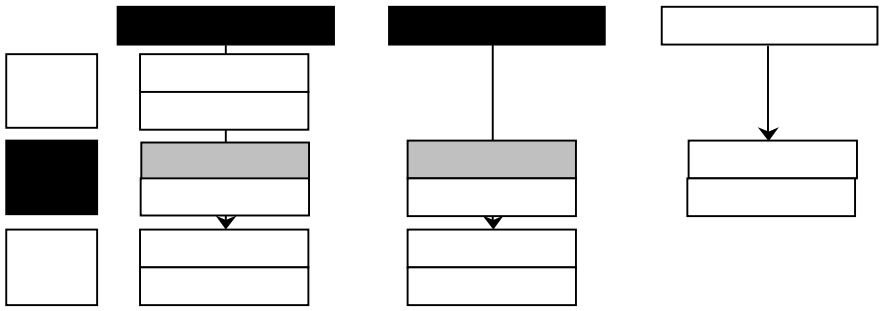


Chapter 6: Phase 3 Empirical Analysis



This chapter presents empirical analysis from *Phase 3* of the study. This phase has three main objectives – to examine the structure of *Perceived EPQ*, to validate the proposed *EPQ Scale*, and to assess alternative construct operationalisations. Questionnaires were distributed to all e-procurement users in the four U.K. cases (Section 4.6.1), yielding a response rate of 92.9%. Factor analysis is used to examine the latent structure of *Perceived EPQ*. Decisions and analysis for the nine-stage process, noted in section 4.6.4, are presented in the first part of this chapter. In section 6.2, the refined *EPQ Scale*, based on *Phase 3* analysis, is tested for reliability and validity. Finally, the relative merits of a paired-statement and a single-statement approach in calculating *Perceived EPQ* are examined in section 6.3.

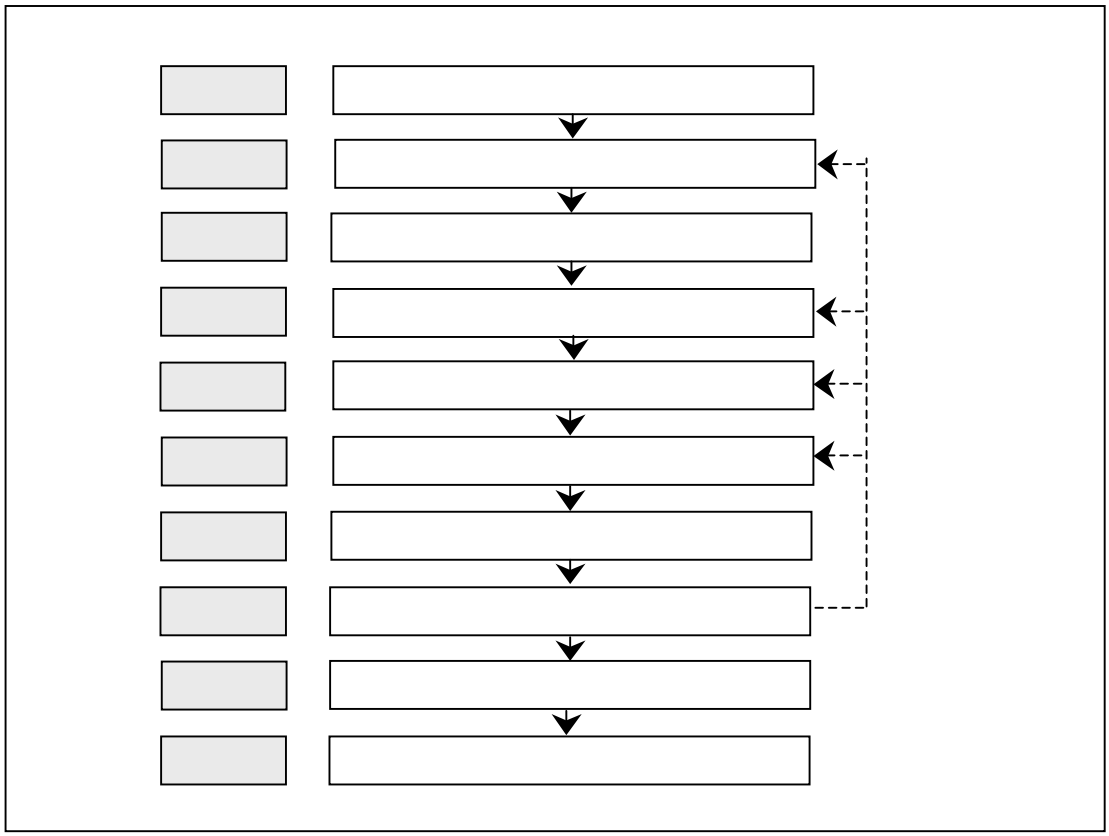
6.1 Perceived EPQ Factor Analysis



As highlighted in the diagram above, this section uses data from *Phase 3* to examine *Research Questions 1* and *2*. Prior to *Phase 3* of the study, the only assumption regarding the structure of *Perceived EPQ* is that variables relate to either 'systems' or 'support'. Therefore, factor analysis is used to examine the latent structure of the proposed *EPQ* variables in greater detail. Factor analysis is an interdependence procedure used to examine relationships among variables and to identify their underlying structure. It allows large numbers of inter-correlated variables to be condensed into a small subset of factors, whilst retaining the essential character and explanatory power of the original variables. These factors simplify multivariate analysis and provide a small set of concepts to consider in subsequent strategic

decision-making (Hair *et al.* 1998). Factor analysis involves a sequential process as laid out in **figure 27** which is examined in order.

Figure 27. Factor Analysis Process



6.1.1 Method Selection

The nature of the research problem largely determines whether the factor analysis should be confirmatory (*CFA*) or exploratory (*EFA*). Mulaik (1990) argues that factors structures should be based on theory and factor analysis should therefore be confirmatory. However, Velicer and Jackson (1990) suggest that using *EFA* to determine factor structures based on empirical data is equally valid. Because the study is exploratory, *EFA* is most appropriate and the factor structure is ultimately suggested by the data rather than theory (Hair *et al.* 1998; Sekaran, 2003).

6.1.2 Factor Design

There are three choices prior to carrying out *EFA* (Hair *et al.* 1998). These are the type of correlations used, the number of variables, and the sample size.

Correlation Type

The vast majority of factor analysis is R-type, in that it calculates the correlation matrix of variables rather than respondents. In R-type *EFA*, rows relate to subject responses, columns relate to variables, and factors are clusters of variables at a given point in time. Q-type *EFA*, where factors relate to inter-correlations between respondents, is rare because researchers tend to apply cluster analysis instead. This study uses R-type factor analysis.

Number of Variables

There are a variety of different 'rules' regarding the number of variables that are appropriate for *EFA*. Thurstone (See Kim & Mueller, 1978, p77) recommends at least three variables per factor. Velicer and Fava (1998) argue that the chance of reproducing the population factor pattern is improved as one increases the variables-to-factor ratio. They argue that, because some variables will be dropped during factor analysis, one should start with between 6 and 10 variables per factor. However, Wuensch (2004) states that this approach often creates 'bloated factors'. Many variables with similar meanings can result in sub-optimal solutions with illusory factors. Therefore, he argues that it is better to start with a small set of highly defensible variables that represent the construct in question. This view is reinforced by Hair *et al.* (1998) who suggest that a minimum number of variables should be included, whilst maintaining a reasonable number per factor. In this case, the 33 *EPQ* variables are used for the factor analysis, ultimately representing a variable-to-factor ratio of 5.5.

Sample Size

Researchers have also given guidelines on how many subjects are necessary for factor analysis. Some suggests a sample size greater than a fixed number, which varies depending on the author. Suggestions for *N* include 100 (Hatcher, 1994), 100-200 (Velicer & Fava, 1998), 150-300 (Hutcheson & Sofroniou, 1999) and 200 (Gorsuch, 1983). Other authors determine the appropriate sample by the subject-to-variable (*STV*) ratio. Bryant and Yarnold (1995) suggest an *STV* no lower than 5, whilst an *STV* of 10 appears to be a popular cut-off point. Finally, MacCullum *et al.* (2002) contend that communality (variance in each variable accounted for by the factor solution) plays a mediating role in determining sample size. Where communalities are

high (>.6) a sample of well below 100 may be acceptable. However, as communalities fall, the number of subjects needed for factor analysis increases. In this research, the sample size is 274, representing a *STV* ratio of 8.30-to-1 and exceeding most absolute recommendations. The average communality is .64, making the sample much higher than the minimum suggested by MacCullum *et al* (2002).

6.1.3 Testing Assumptions

There are a number of assumptions that should be met prior to applying *EFA* (Hair *et al.* 1998). These include appropriate variable specification, use of interval data, no non-response bias, minimal missing data, minimal outliers, linearity, multivariate normality, and moderate or high inter-correlations.

Variable Specification & Interval Data

The selection of variables for *EFA* is based on both extensive literature review and analysis of interviews. As such, the 33 variables included in correlation matrix should accurately represent the *Perceived EPQ* construct. In addition, the use of difference scores in scale development is common (Parasuraman *et al.* 1994a). Factor analysis assumes the use of *interval data*. It is worth noting that Kim and Mueller (1978) question the extent to which ordinal data actually limits the results of factor analysis. However, in this research all variables in the *EFA* are interval in any case.

Non-Response Testing

Given the extremely high response rate, non-response bias is unlikely to be an issue. T-tests comparing the responses of early and late respondents find no significant differences between the means of the two groups for any of the *Perceived EPQ* variables. This test indicates that the views of respondents and non-respondents are likely to be similar.

Missing Data Testing

Missing data creates the potential for hidden bias and impacts on the practical sample size for subsequent multivariate analysis (Hair *et al.* 1998). Missing Value Analysis (*MVA*) indicates that there no missing values for expectation, perception or gap scores

from the *EPQ scale.* However, there are a number of blank responses for system compliance, contract compliance, and categorical variables **(Table 31)**.

Table 31. Missing Data

Code	Variable Detail	No.	Missing	
			Count	Percent
mporders	Orders placed via *Marketplace* per month	244	30	10.9
nonmporders	Orders placed outside *Marketplace* per month	229	45	16.4
syscompliance	% orders placed via *Marketplace*	249	25	9.1
contcompliance	% orders placed via a contract	206	68	24.8
experience	Experience in months with *Marketplace*	256	18	6.6
itskills	Perceived IT skills (1-7 scale)	271	3	1.1

The percentage of missing data is generally low, with a significant proportion of blank responses caused by inapplicability of questions to certain respondents. For example, 26 of the 274 respondents indicated that they do not use *Marketplace* to place orders. Therefore, these users will not have responded to questions relating to the number of orders or their approach to ordering. However, even discounting 'non-applicable' missing data, there are still 42 unexplained blank responses for measures related to *contract compliance.* This may have been caused by confusion due to poor question wording, a lack of knowledge, or unwillingness to divulge sensitive information. **Table 32** tabulates the patterns of blank responses for the data.

Table 32. Tabulated Missing Data Patterns

Number of Cases	Missing Patterns [a]						Complete if ...(b)
	itskills	experience	mporders	SysCompliance	nonmporders	ContCompliance	
182							182
9		x					191
11					x		193
32						x	215
3		x				x	227
25			x	x	x	x	255

Patterns with less than 1% cases (3 or fewer) are not displayed.
a Variables are sorted on missing patterns.
b Number of complete cases if variables missing in that pattern (marked with X) are not used.

T-tests between missing and non-missing groups of Y are performed to determine whether significant differences exist for all other dependent variables **(Table 33).** These tests indicate whether data is 'missing at random' (*MAR*) or 'missing completely at random' (*MCAR*).

Table 33. Missing Data T-Tests

Variable (Y)	Non-Significant Differences	Significant Differences	Percentage
Experience	101	4	3.81
MP Orders	101	4	3.81
Non-MP Orders	98	7	6.67
System Compliance (%)	96	9	8.57
Contract Compliance (%)	89	16	15.24
Total	**486**	**39**	**8.02**

In the vast majority of cases there is no significant differences between variables for groups with missing and non-missing Y values. It is also worth noting that some differences will occur simply by chance and do not indicate non-random patterns. In addition, an overall test of randomness was performed. Analysis indicates that there are no significant differences between the two patterns (Little's *MCAR Test*: Chi-Square 116.900, DF 1537, Sig. 1.000), so the missing data can be classified as *MCAR*.

There are a number of options when handling blank responses. Blank responses to interval scales can be replaced with a mid-point, the variable mean, the case mean, a random number from the scale, or through regression imputation. However, these options are more difficult when one considers categorical data. Provided the sample size is fairly large and the number of blank responses relatively low, the best option may be to omit the case where data relating to a particular analysis is missing (Sekaran, 2003). In this study, excluding missing values is the best choice, because the valid sample for statistical tests remains high (>200).

Outlier Testing

Figure 28 shows the histogram and normality plot of standardised residuals. One can see that these residuals follow a normal distribution. The scatter plot of standardised residuals versus standardised predicted values is shown in **figure 29.** Again we see a positive correlation between predicted and actual values.

Figure 28. Histogram & *PP* Plot of Standardised Residuals

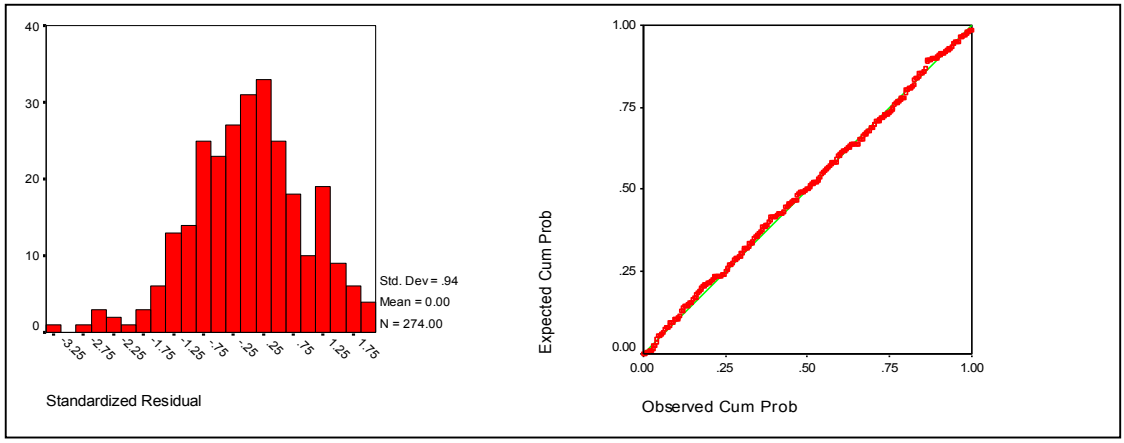


Figure 29. Scatter plot of predicted versus actual residuals

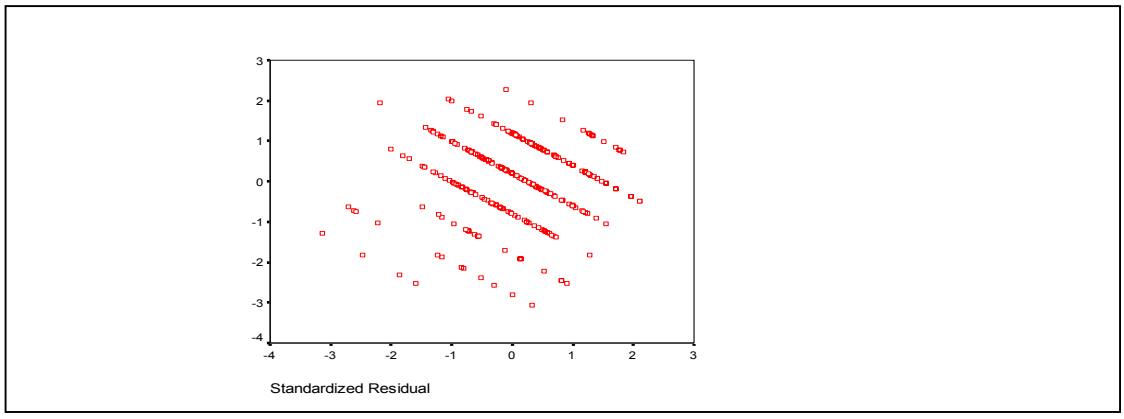


Table 34 shows the results of *Mahalanobis* testing. Case 115 is the only one with a standardised residual +/- three standard deviations from the predicted residual. In this case, the predicted value of *OEPQ* is much higher that the actual rating given.

Table 34. Casewise Diagnostics for Outliers

Case Number	Std. Residual	*OEPQ Rating*	Predicted Value	Residual
115	-3.142	1	3.51	-2.51

Dependent Variable: overall combined system and support perceptions

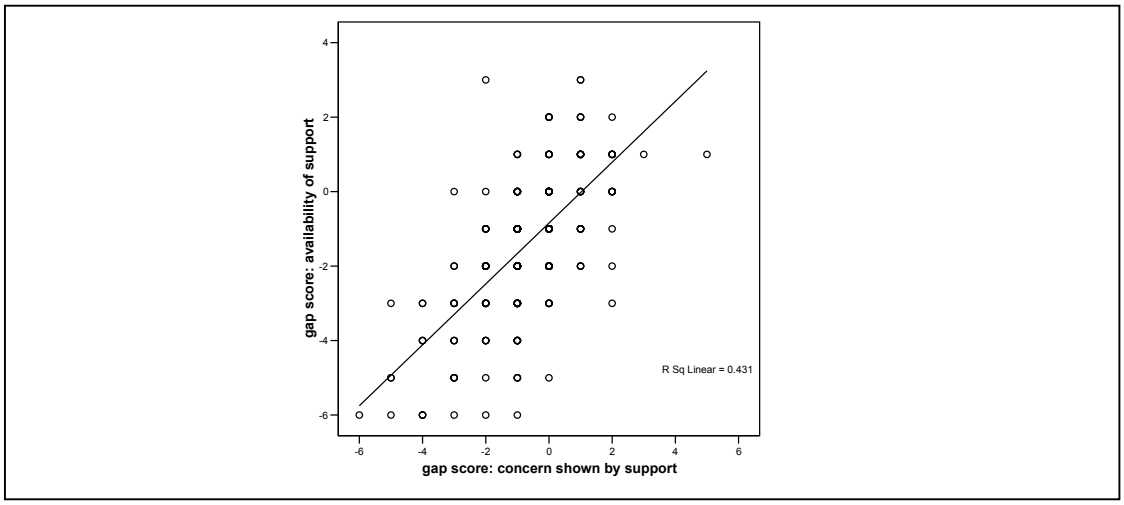
Hair *et al.* (1998) argue that unless one can prove that the outlier is not representative of any observation in the population, it is not advisable to delete it from analysis. They argue that whilst deleting outliers may improve the results of multivariate analysis, this comes at the cost of generalisation. In this case, there is no reason to suspect the outlier to be unrepresentative. Examining the questionnaire, it is clear that, despite high scores for system factors, the low scores for *Training* and

Professionalism have dominated the *OEPQ Rating.* Therefore, all data is retained prior to factor analysis.

Linearity Testing

Factor analysis assumes that all variables are *linear*. Non-linear correlations can lead to underestimations of the actual relationships between variables. Scatter plots were used to examine the linearity of data. All variables exhibit positive linear relationships. The typical relationship found in linear screening is shown below **(Figure 30).**

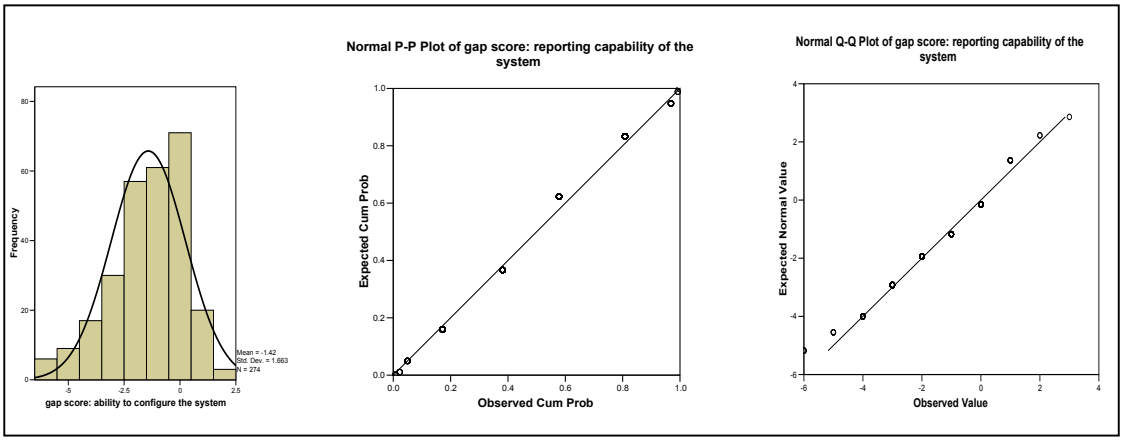
Figure 30. Typical Relationship between *EPQ* Variables



Multivariate Normality Testing

Highly skewed data can create problems for factor analysis. Screening for normality involves the use of histograms, *PP* and *QQ* plots. These reveal that data exhibits multivariate normality, with limited skew and kurtosis **(Figure 31).**

Figure 31. Typical Histogram, *PP* & *QQ* Plots



Inter-correlation Testing

It is important to ensure that there are sufficient *inter-correlations* in the data matrix to justify the use of factor analysis. Using a matrix with low inter-correlations defeats the purpose of factor analysis, as the solution is likely to have nearly as many factors as variables. On the other hand, very high inter-correlations may indicate multi-collinearity problems. T**able 35** summarises the correlations between the variables used in the factor analysis.

Table 35. Summary of *EPQ* Correlations

Correlation	Frequency	Cumulative
0.0 – 0.99	0	0
0.1 – 0.199	21	21
0.2 – 0.299	149	170
0.3 – 0.399	175	345
0.4 – 0.499	80	425
0.5 – 0.599	58	483
0.6 – 0.699	27	510
0.7 – 0.799	15	525
0.8 – 0.899	3	528
0.9 – 0.999	0	528
Significance		
** Correlation significant at 0.01 level (2-tailed)	523	523
* Correlation significant at 0.05 level (2-tailed)	2	525
Correlation is not significant	3	528

Visual inspection of the correlation matrix reveals that 67.8% of correlations are greater than 0.30 – the cut-off recommended by Hair *et al.* (1998). The average is .38 and that the vast majority of these are significant at the .01 level. Further empirical examination of *EFA* adequacy was assessed using the following statistical methods:

1. *Anti-image Matrix*
2. *Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy*
3. *Bartlett's Test of Sphericity*

The anti-image matrix contains negative partial correlations between variables. In this case, the small values close to zero indicate few unexplained correlations between variables. *KMO* indicates how well data is likely to factor based on correlation and partial correlation. *KMO* scores for each variable, shown on the diagonal of the anti-image correlation matrix, range from .863 to .968. The overall *KMO* statistic is .926 **(Table 36).** All these scores exceed various minimum cut-off marks (.50, .60, .70, .80) suggested in the literature (Hair *et al.* 1998). Bartlett's test of sphericity indicates

the presence of correlations between variables in the entire correlation matrix. The low significance (<.000) disproves the null hypothesis that there are few significant relationships in the data.

Table 36. *KMO* & Bartlett's Test

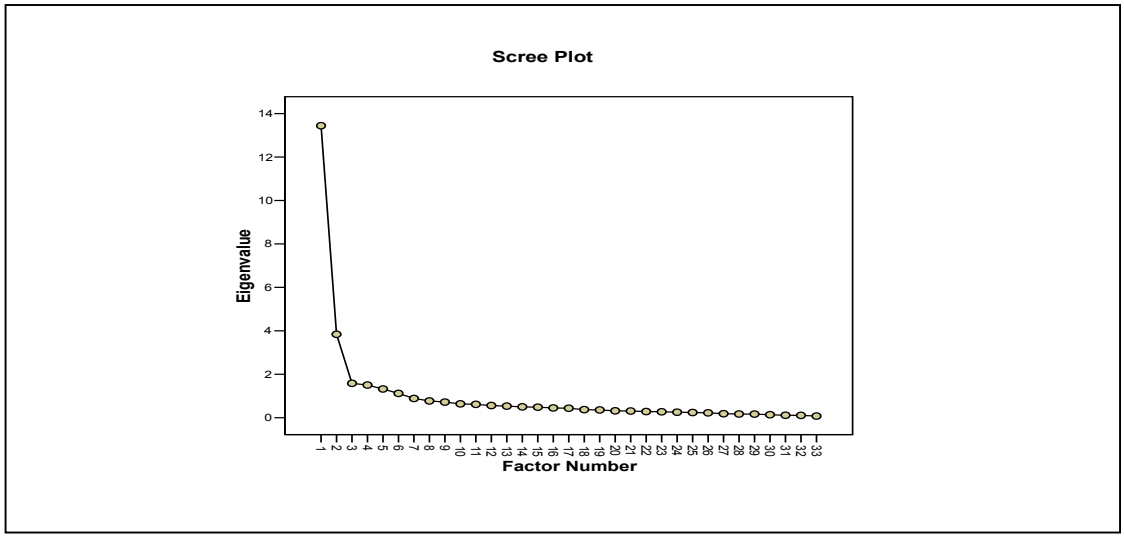
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.926	
Bartlett's Test of Sphericity	Chi-Square	6808.867
	df	528
	Sig.	.000

Taken together the tests relating to variable specification, use of interval data, non-response bias, missing data, outliers, linearity, multivariate normality, and inter-correlations provide a minimum standard which must be past before factor analysis should be undertaken. All these tests indicate the suitability for proceeding with *EFA*.

6.1.4 Retention of Factors

An important decision in *EFA* is determining the number of factors to extract. One method is the scree test, which uses a plot of eigenvalues against the number of factors. The point which the eigenvalues begin to level off can be used as a cut-off point for retaining factors (Velicer & Jackson, 1990). The scree test is quite subjective and authors have accused those using the method of 'fudging'. In this research there are two 'shoulders' in the scree plot **(Figure 32)**, suggesting between three and eight factors for extraction.

Figure 32. *EPQ Scale* Scree Plot



A more rigorous and widely used method for determining the number of factors to extract is the latent root criterion (Dunteman, 1989). The Kaiser-Guttman rule states that because each variable contributes a value of 1 to the total eigenvalue, only factors with eigenvalues above 1 should be retained. Eigenvalues are considered an appropriate method for determining the number of factors when the number of variables is between 20 and 50 (Hair *et al.* 1998). In this research, the initial eigenvalues suggest a solution of six factors **(Table 37).** Total variance extracted is 74.76%, whilst common variance extracted is 68.75%. This is above the 60% minimum suggested by Hair *et al.* (1998) for social science research.

Table 37. *EPQ Scale* Eigenvalues

Factor	Eigenvalue	Factor	Eigenvalue	Factor	Eigenvalue
1	13.440	12	.561	23	.273
2	3.840	13	.533	24	.254
3	1.584	14	.501	25	.241
4	1.503	15	.485	26	.225
5	1.323	16	.450	27	.186
6	1.119	17	.436	28	.171
7	.886	18	.372	29	.166
8	.774	19	.356	30	.138
9	.720	20	.318	31	.113
10	.638	21	.309	32	.108
11	.616	22	.285	33	.076

According to Hair *et al.* (1998), a more pragmatic approach is to combine both scree test and latent root criteria in determining the number of factors for extraction. The researcher should always seek a parsimonious solution that is both logical and robust. The methods act as a guide, but the final decision on retaining factors should be made on issues of interpretability.

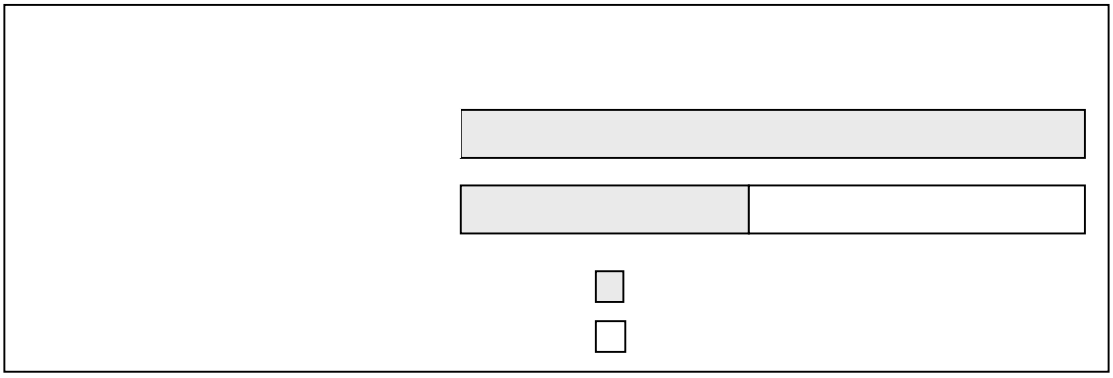
6.1.5 Extraction

Having determined how many factors to extract, the researcher must decide how factors are identified during analysis – the *extraction method.* There are a number of different approaches, including principal components analysis (*PCA*), principal axis factoring (*PAF*, a.k.a. common factor analysis), image factoring, maximum likelihood factoring, alpha factoring, un-weighted least squares factoring, and generalized least

squares factoring. Of these, the two most widely used extraction methods are *PCA* and *PAF*.

Which of these two methods is most appropriate is open to debate (Borgatta *et al.* 1986; Gorsuch, 1990; Mulaik, 1990; Snook & Gorsuch, 1989; Hair *et al.* 1998). The critical difference between the two models relates to variance **(Figure 33).** *PCA* uses total variance (common, specific and error) when deriving factors and can therefore inflate the actual association between variables and factors (Snook and Gorsuch, 1989). Conversely, *PAF* considers only common (shared) variance in deriving factors and is particular useful in identifying underlying (latent) factors that reflect what the variables share in common.

Figure 33. Types of Variance Used in Factor Analysis



Hair *et al.* 1998

PAF is selected in this research for three reasons. Firstly, the primary objective is to identify the latent factors of *Perceived EPQ*. Secondly, the more restrictive assumptions of *PAF* are often seen as more theoretically based (Hair *et al.* 1998). Finally, academics modelling service delivery in various research settings tend to favour *PAF* over *PCA.*

6.1.6 Rotation

Researchers aim to produce solution where variables load highly on a single factor and have small loadings on all other factors. Generally, un-rotated factor solutions do not produce simple structure and are therefore difficult to interpret. Factor rotation seeks to simplify the solution by maximising high loadings and minimising low

loadings. Rotation redistributes variance from earlier factors to later ones in order to produce a factor pattern that is more theoretically meaningful.

There are two basic types of rotations: *orthogonal* and *oblique.* Orthogonal rotation derives a solution based on the assumption that factors are not correlated to one another. In social sciences, this is rarely a logical assumption to make (Sekaran, 2003). In contrast, oblique rotation assumes factors are correlated when deriving a factor solution. In this study, it is logical to assume that attitudinal factors based on the *EPQ* variable scores will be correlated. Therefore, oblique rotation is selected, because it is most likely to produce an interpretable solution. *Promax* oblique rotation produces marginally better results than *Direct Oblimin* oblique rotation.

6.1.7 Interpretation

Having extracted a six-factor solution using *PAF* and subjected it to oblique rotation, the next stage is to identify significant loadings for each variable. This allows the researcher to examine the underlying structure of the *Perceived EPQ* construct and to assess how well variables load on individual factors. To ensure practical significance, Hair *et al.* (1998) suggest the following general rule of thumb. Factor loadings of ± .30 meet the minimum level, ± .40 are considered more important, whilst loadings above ± .50 are considered practically significant. A more rigorous approach in determining significant factor loadings relates to the sample size **(Table 38).** There is an inverse relationship between sample sizes and loading significance (Hair *et al.* 1998). When the sample is small, higher loadings are necessary to be considered significant.

Table 38. Guidelines for Identifying Significant Factor Loadings

Factor Loading	Sample Size Needed for Significance [a]
.30	350
.35	250
.40	200
.45	150
.50	120
.55	100
.60	85
.65	70
.70	60
.75	50

[a] Significance is based on a .05 significance level, a power level of 80 per cent, and standard errors assumed to be twice those of conventional correlation coefficients.

Based on the sample size of 274 in this research, all loadings greater than .35 are considered significant. Of the 33 variables in the original factor solution, all but three load solely on a single factor. Purification of the original solution is now discussed.

6.1.8 Scale Purification

Scale purification involves the researcher attempting to find the most theoretically and operationally robust factor solution. This can involve changes in the number of variables, number of factors, extraction method, or rotation method.

Deletion of variables is an iterative process. When a variable is deleted, the factor analysis is re-run to assess the possible improvement to the solution. Only then are further variables considered for deletion. The first criterion is if a variable fails to significantly load on any factor. The *visual appeal* variable has no significant loadings (>.35), with its highest loading being .242. The failure to load is largely due to the low expectations of aesthetics relative to other *EPQ* variables. The *visual appeal* variable is therefore deleted and all remaining variables load on at least one factor.

The second criterion for deletion is based on cross-loading – variables which have a significant loading (>.35) on more than one factor. Only two variables – *talking users' language* and *encouraging feedback* – load on more than one factor. Both of these variables cross-load on two factors that relate to the support provided to internal customers. It appears from a review of the questionnaire, that respondents may not have universally understood what was meant by the variables. However, it is clear that issues related to both are partially incorporated in other remaining variables. *Talking users' language* is reflected in perceptions of *knowledge, problem resolution, friendliness, concern shown, appropriate training,* and *information provision.* Likewise, perceptions of *encouraging feedback* partially relate to *support availability, support reliability, support responsiveness, friendliness,* and *concern shown.* As a result of cross-loading, these two variables are also omitted from further analysis. Finally, variables with very low item-to-total correlations[5] are considered for deletion.

[5] Correlation between the variable/item score and the sum of scores on all other items making up the factor to which the variable is assigned

No variables have item-to-total correlations below .5 and so all are retained on this criterion.

Despite the fact that latent root criterion suggests a six-factor solution, Hair *et al.* (1998) suggest that it is advisable to examine alternative number of factors to arrive at the most parsimonious solution. Therefore, five-factor, seven-factor and eight-factor solutions are examined. However, none of these solutions improve the interpretability of the factor matrix and are consequently rejected. No changes are made to the method of extraction or rotation, because both of these decisions are based on theoretical, rather than operational, considerations. From the proposed *EPQ Scale*, just three variables are deleted during scale purification.

6.1.9 Creation of Composite Measure

Table 39 shows the range of options available for creating a composite measure.

Table 39. Data Reduction Options

Options	Advantages	Disadvantages
Surrogate Variable	Simple to administer and interpret	Not representing all 'facets' Prone to measurement error
Factor Scores	Composite of all variables loadings on a factor Reduces measurement error	Hard to replicate Difficult to interpret
Summated Scale	Easy to replicate Represent all 'facets' Reduce measurement error	Only considers significant loading factors (>.35 in this research)

One way to reduce the number of variables is to select a single surrogate variable for each factor. The advantage of this option is that it is easy to administer and interpret. However, a surrogate variable does not represent all the elements of a factor and is prone to measurement error. A better option is likely to be the creation of a composite measure. Composite scores are beneficial in reducing measurement error, because they use multiple indicators (variables) rather than relying on single responses. Additionally, they help to accommodate the richness of original variables, whilst maintaining model parsimony. Composite scores can be formed through factor scores or summated scales. The key advantage of factor scores is that they represent a composite of all variables loading on a factor (Hair *et al.* 1998). The downside of this option is that they are difficult to replicate in subsequent research work, because they are based on individual study factor matrices. A more popular method is to use the

arithmetical average of variables making up each factor (Parasuraman *et al.* 1988; Pitt *et al.* 1995). This has the advantage of being easy to replicate, whilst incorporating the scores of all variables (Hair *et al.* 1998). Therefore, an arithmetical average is used in the creation of composite scores for *EPQ* factors.

6.1.10 Final Factor Solution

Table 40 gives an overview of the key decisions and findings at each stage of the *EFA* process, whilst **Table 41** shows the *Perceived EPQ* factor solution with details of factor loadings for each variable.

Table 40. Summary of *EFA* Process

1. Method Selection	Exploratory Factor Analysis (*EFA*)
2. Factor Design	Correlation: Variables R-Type Variables: 33 *EPQ* scores, variable-to-factor ratio 5.5 Sample: 295, sample-to-variable ratio 8.94
3. Testing Assumptions	Variable specification: extensive literature + empirical data Interval data: Yes Outliers: Retained, extraordinary event explained Missing Data: None Linearity: All positive linear Normality: All normal with limited skew and kurtosis Correlations: Ave .38; *KMO* .926; Test of sphericity <.00
4. Retention of Factors	Latent root criterion – all Eigenvalues > 1; Six factors retained
5. Extraction Selection	Principal Axis Factoring (PAF a.k.a. common factor analysis)
6. Rotation Selection	Oblique Rotation – Promax
7. Interpretation	Loadings >.35 based on significance loading for 274 respondents
8. Scale Purification	Number of variables – 30 variables retained no load criterion: *visual appeal* deleted cross load criterion: *encouraging feedback* + *talking users' language* deleted item-to-total criterion: no variables deleted Number of factors – 6 retained No improvement with 5, 7, and 8 factor solutions Extraction Method – No change Rotation Method – No change
9. Creation of Composite Measure	Arithmetic average of variables making up each factor
10. Scale Validation	**Section 6.2**

Table 41. *Perceived EPQ* Factor Solution

Variable	Professionalism	Processing	Training	Specification	Content	Usability
support availability	.830					
support reliability	.784					
support responsiveness	.899					
knowledge	.822					
support flexibility	.710					
problem resolution	.757					
confidentiality	.829					
friendliness	.867					
concern shown	.919					
order processing		.664				
ease of authorisation		.547				
orders to suppliers		.901				
order lead-time		.807				
processing complex orders		.490				
on-time delivery		.805				
order accuracy		.693				
system security		.567				
timely training			.888			
appropriate training			.982			
information provision			.654			
FMS integration				.666		
invoice reconciliation				.644		
system configurability				.486		
reporting capability				.719		
loaded suppliers					.738	
loaded catalogues					.870	
ease of search					.473	
system availability						.409
screen loading						.734
system navigation						.625

Deleted
- talking users' language
- encouraging feedback
- visual appeal

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.
Rotation converged in 6 iterations.
All loadings <.35 omitted based on significance criterion

Examination of the content of the items making up each *EPQ* factor results in the following labels – *Professionalism, Processing, Training, Specification, Content,* and *Usability.*

Professionalism is concerned with the ongoing support provided to internal customers of e-procurement. Support personnel should always be available, get back to users quickly and when they say they will. Whilst technical expertise is important in solving problems, the attitudes of support personnel also appears to be important. These attitudes are measured through perceptions of friendliness, concern shown, and the confidentiality of dealings. In addition, support should be flexible in dealing with users and be seen to deal effectively with problems.

Processing focuses on the impact that e-procurement has on order cycle-time. Prior to order delivery, variables measured include the speed of processing an order using the system, the ease of authorising these orders, and how quickly orders reach suppliers. Internal customers will also have perceptions of the impact on lead-time, of how often orders are delivered on time, and whether the right goods / services are delivered. In addition, the ability to process complex orders and the perceived security of the system fall into this factor.

The *Training* factor is the second factor which considers the provision of e-procurement support. It questions how effectively information regarding how to use an e-procurement system is passed from service providers to internal customers prior to implementation. It is clearly important to provide users with training that suits their individual needs. This may involve online tutorials, group sessions, advanced training on certain aspects of the system, refresher courses, or one-to-one help. However, it is also important to provide this training at the right time. In addition, provision of information about system enhancements and new contracts/suppliers is included in the *Training* factor.

Specification considers perceptions of system functionality. The ability of an e-procurement system to integrate with the *FMS* and reconcile invoices efficiently may be perceived as of great benefit to some users. In addition, how easy the system is to configure to individual or departmental requirements may have a significant effect on

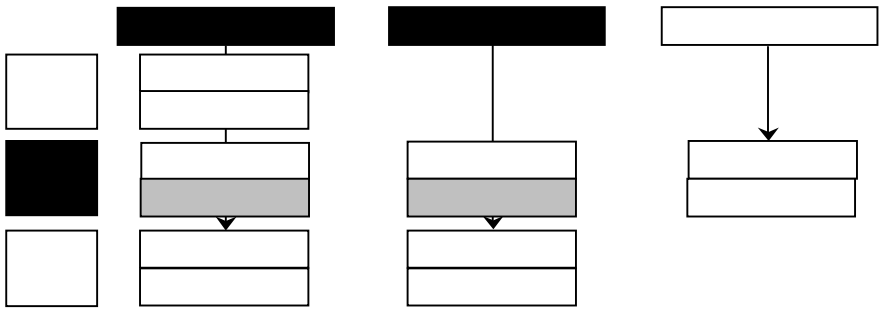
Perceived EPQ. Finally, a number of users will have expectations relating to management information, so the reporting capability of the system will be important.

The *Content* factor considers how e-procurement users perceive what is actually loaded onto the system and how easy it is to find. Clearly, users must be able to access content easily through effective search tools. However, unless the content loaded onto the system is appropriate, perceptions of the *Content* factor will likely to be low. Users will expect to have both the suppliers and catalogues that they use loaded onto the system. Issues may arise if the central purchasing department refuse to load a supplier because a contract already exists.

Usability considers how easy it is to use the e-procurement system. Firstly, a system should be available at all times. Any downtime can cause serious frustration to potential users. In addition, the speed of connection will have a significant impact on perceptions of *Usability*. If the server used by an organisation is slow, users will perceive the system as difficult to use. Whilst the speed of connection is usually an infrastructure issue and is unlikely to be a something within the control of the procurement department, it may have serious ramifications for *Usability* perceptions. Finally, the system navigation variable is concerned with how easy internal customers find it to work their way through the system, whether it be for order creation, authorisation, receipting, payment, or reporting.

Having derived a factor solution incorporating 30 of the original 33 *EPQ* variables, the next section presents the process of scale validation.

6.2 EPQ Scale Validation



This section provides details of tests seeking to validate the refined *EPQ Scale*. Scale data has little value unless both reliability and validity can be demonstrated (Sekaran, 2003). Therefore, as noted in section 4.6.4, validation efforts focus on a number of different issues. *Reliability* is concerned with how accurate the tool is in measuring *Perceived EPQ*. *Validity* examines whether the tool does in fact measure the construct in the first place (Flynn *et al.* 1990; Bagozzi *et al.* 1992). That is, whether in operationally defining *Perceived EPQ*, one has either omitted important factors or included irrelevant ones (Sekaran, 2003). This involves the examination of *content validity, construct validity,* and *predictive validity.* The four elements of *EPQ Scale* validation are now discussed in turn.

6.2.1 *EPQ Scale* Reliability

The reliability of a scale is shown by the extent to which it is without bias and ensures consistent measurement across time and settings (Sekaran, 2003; Flynn *et al.* 1990). As such, it measures the ability to replicate data collection through questionnaires and other empirical techniques. Reliability is an important prerequisite in establishing validity, because even highly valid results are meaningless if measures yield inconsistent results (Schwab, 1980).

Test-retest reliability is demonstrated if the perception scores of individuals at two different points in time are significantly correlated. However, in this case, it reliability cannot be assessed, because the research was not longitudinal. Alternatively, if there is a high correlation between two similar forms of a measure, *parallel forms reliability* can be established. However, in common with the majority of other research (Flynn *et al.* 1990), this is not feasible as only one form of questionnaire is available.

Therefore, assessing reliability must focus instead on the *internal consistency* of the *EPQ Scale* (Flynn 1990). Internal consistency indicates how well the variables measuring the construct hang together as a set (Sekaran, 2003). It is established if there is a high degree of inter-correlation among the 30 variables making up the *EPQ Scale*. The most widely applied measure of internal consistency is Cronbach's Alpha

(Cronbach & Meehl, 1955) which is calculated by averaging the inter-correlations among variables measuring a construct. It is popular because it is the mean of all possible split-half coefficients, rather than a single arbitrary split as used in the split-half measure. High levels of internal consistency reliability are indicated the closer Cronbach Alpha is to 1.0. A number of authors suggest a minimum Alpha of .70 (Nunally, 1978; Parasuraman *et al.* 1988; Flynn *et al.* 1990). However, Nunally (1978) also argues that a lower threshold of .60 may be acceptable when developing new scales through exploratory research.

Table 42 shows reliability alphas for each factor and the entire scale. In addition to the original alphas, standardised alphas are also reported. These take into account the number of items in an instrument and ensure alpha scores are not over-inflated. Internal reliability is indicated by Alpha coefficients which range from .751 to .954 for the six dimensions and .949 for the *EPQ Scale*. These coefficients easily exceed the recommended cut-off point of .70 and .60 (Nunally, 1978; Flynn *et al.* 1990). **Table 43** shows item-to-total correlations for the factor solution. The high scores, ranging from .539 to .903, with an average of .716, also indicate internal consistency of the *EPQ Scale* (Flynn *et al.* 1990).

Table 42. *EPQ Scale* Cronbach Alphas

Factor	No. Items	Un-standardised Cronbach	Standardised Cronbach
Professionalism	9	.953	.954
Processing	8	.895	.897
Training	3	.919	.919
Specification	4	.816	.818
Content	3	.797	.796
Usability	3	.751	.751
EPQ Scale	30	.947	.949

Table 43. *EPQ Scale* Item-to-Totals

Variable	Item-to-total		Variable	Item-to-total
support availability	.807		timely training	.859
support reliability	.818		appropriate training	.903
support responsiveness	.869		information provision	.755
knowledge	.840			
support flexibility	.791			
problem resolution	.824		FMS integration	.599
confidentiality	.817		invoice reconciliation	.692
friendliness	.763		system configurability	.592

concern shown	.793		reporting capability	.674
order processing	.721		loaded suppliers	.666
ease of authorisation	.644		loaded catalogues	.689
orders to suppliers	.744		ease of search	.571
order lead-time	.756			
processing service orders	.608		system availability	.539
on-time delivery	.724		screen loading	.639
order accuracy	.636		ease of navigation	.565
system security	.574			

Internal reliability for the *EPQ Scale* is clearly demonstrated by Cronbach Alpha scores and item-to-total correlations. However, further reliability tests through replication studies will prove the *stability* of the scale over time.

6.2.2 *EPQ Scale* Content Validity

Content validity is a judgement by experts of how well the variables and factors of a construct are delineated (Sekaran, 2003). In this study, content validity is the extent to which the *EPQ Scale* accurately reflects *Perceived EPQ*. The more the scale variables represent the domain of the construct being the measured, the greater the content validity. Content validity cannot be determined statistically, but rather by experts with reference to experience and literature (Flynn *et al.* 1990; Sekaran, 2003). Assessing content validity involves two assessments:

1. *How the scale was explicated*
2. *How well the scale represents the construct*

The procedures used in developing the *EPQ Scale* have been detailed earlier in the thesis. The attention to *E-Procurement, Service Quality, Internal Service Quality, Information Systems Quality,* and *E-Service Quality* literature should have ensured that key variables are included in the scale. Additionally, the qualitative research work means that the scale is empirically well-grounded. Finally, in line with advice from Sekaran (2003), the scale has been examined by a panel of expert judges. There is a consensus amongst these judges that variables in the scale adequately delineate *Perceived EPQ* **(Table 44).** Based on the two assessments listed above, one can conclude that the *EPQ* scale possesses content validity.

Table 44. *EPQ* Expert Panel

Name	Position	Organisation
Dr Simon Croom	Senior Lecturer	*University of Warwick*
Hilary Bates	Senior Research Fellow	*University of Warwick*
Gary Richardson	Head of Marketplace	*IDeA*
Russell Charlesworth	Director	*EGS*
Adrian Gibson	Head of Procurement	*Essex County Council*
John Wickes	Head of Procurement	*Braintree District Council*
Jon Cooke	Head of Finance	*Maldon District Council*

6.2.3 *EPQ Scale* Construct Validity

Construct validity measures the extent to which a scale is a good operational definition of a construct (Flynn *et al.* 1990). *Discriminate validity* is indicated if the factors and variables are truly different for one another (Carman, 1990). *Convergent validity* is established when variables load on a single factor and correlate with other variables in their assigned factors (Parasuraman *et al.* 1988).

Establishing construct validity is difficult because it is not possible to directly assess the constructs (Flynn *et al.* 1990). Instead, one must make inferences based on empirical tests. *EFA c*an be used to establish construct validity, by identifying factors and suggesting variables for deletion. Bagozzi (1981) examines the 'rules for convergence and discrimination', stating that variables representing a factor should correlate highly with one another and not with variables from any other factor. The rules of variable convergence and discrimination hold good for this data. The factor analysis reveals that of the original 33 variables, 30 have high loadings on a single factor **(Table 41)**. In addition, the scale exhibits high Alphas **(Table 42)** and item-to-total scores **(Table 43).**

In line with other research (cf. Parasuraman *et al.* 1988; Pitt *et al.* 1995), the correlation between the *EPQ* factors and responses to the single *OEPQ Rating* is assessed **(Table 45).** The high correlation between the two measures provides additional evidence of construct validity.

Table 45. Pearson Correlation: *EPQ Scale* & *OEPQ Rating*

	OEPQ Rating	*EPQ Score* (Ave 6 Factors)	Professionalism	Processing	Training	Specification	Content	Usability
OEPQ Rating	**1**	.698(**)	.669(**)	.561(**)	.549(**)	.527(**)	.397(**)	.414(**)
EPQ Score	.698(**)	**1**	.756(**)	.779(**)	.701(**)	.762(**)	.706(**)	.762(**)
Professionalism	.669(**)	.756(**)	**1**	.478(**)	.623(**)	.463(**)	.351(**)	.443(**)
Processing	.561(**)	.779(**)	.478(**)	**1**	.379(**)	.641(**)	.513(**)	.596(**)
Training	.549(**)	.701(**)	.623(**)	.379(**)	**1**	.332(**)	.270(**)	.401(**)
Specification	.527(**)	.762(**)	.463(**)	.641(**)	.332(**)	**1**	.479(**)	.558(**)
Content	.397(**)	.706(**)	.351(**)	.513(**)	.270(**)	.479(**)	**1**	.480(**)
Usability	.414(**)	.762(**)	.443(**)	.596(**)	.401(**)	.558(**)	.480(**)	**1**

** Correlation is significant at the 0.01 level (2-tailed).

6.2.4 Predictive Validity

Predictive validity is derived by examining the predictive power of scale scores on a separate criterion (Flynn *et al.* 1990). It is established when the measure differentiates individuals on a criterion as predicted (Sekaran, 2003). Initial assessment of predictive is made by assessing how well the *EPQ Score* (Average of the 6 factors) predicts variance in the *OEPQ Rating* **(Table 46).** Just under half of variance in the *OEPQ Rating* is explained by the overall *EPQ Score* (R^2 = .486).

Table 46. Linear Regression: *EPQ Score* to *OEPQ Rating*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1(a)	.698(a)	.487	.486	.897

a Predictors: (Constant), *EPQ*
b Dependent Variable: *OEPQ Rating*

Subsequently, multiple regressions are undertaken between the six *EPQ* factors and the *OEPQ Rating*. The combination of these six factors predicts 55.1% of variance in the dependent variable **(Table 47).**

Table 47. Linear Regression: Six *EPQ* Factors to *OEPQ Rating*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1(b)	.749(a)	.561	.551	.838

a Predictors: (Constant), Usability, Training, Content, Specification, Professionalism, Processing
b Dependent Variable: *OEPQ Rating*

Finally, the predictive validity of the six *EPQ* factors is examined using a step-wise multiple regression **(Table 48).** This approach enables the researcher to assess the relative value of each factor to the regression model. The factor with the highest contribution is entered first and others are added based on their incremental improvement to the model. The best solution has four factors which explain 54.9% of variance in *OEPQ Ratings*. Whilst all *EPQ* factors are correlated with the dependent variable, *Professionalism, Processing, Training,* and *Specification* are statistically significant (<0.05). Predictive validity is indicated by the high R^2 values for all regression models.

Table 48. Stepwise Regression: Six *EPQ* Factors to *OEPQ Rating*

Model (e)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1(a)	.669(a)	.448	.446	.931
2 (b)	.723(b)	.523	.520	.866
3 (c)	.736(c)	.542	.537	.851
4 (d)	.745(d)	.556	.549	.840

a Predictors: (Constant), Professionalism
b Predictors: (Constant), Professionalism, Processing
c Predictors: (Constant), Professionalism, Processing, Training
d Predictors: (Constant), Professionalism, Processing, Training, Specification
e Dependent Variable: *OEPQ Rating*

Whilst *Content* and *Usability* are correlated to *OEPQ Ratings*, they produce only a marginal improvement to the regression model. This is because the predictive power of additional independent variables is not only determined by its correlation to the dependent variable, but also its correlation to other independent variables already in the model. The effect of *multicollinearity* is to limit the value of *Content* and *Usability* factors due to their strong relationship with *Professionalism, Processing, Training* and *Specification*. It is important to avoid the conclusion that the factors are inconsequential in driving *Perceived EPQ* simply because they are not included in the stepwise regression model.

It is worth noting that the statistical power of the regression model is partly determined by sample size (Hair *et al.* 1998). Very small samples (<20) often only allow the use of simple regression with one independent variable, with only very strong relationships detected with certainty. There are also problems with very large

samples (>1000) due to over-sensitivity to statistical tests, often indicating statistical significance of almost any relationship. Detecting significant R^2 is also impacted the number of independent variables and the significance level chosen. For this research, using the six *EPQ* factors as independent variables and specifying a .01 significance level, the sample of 274 will detect R^2 values of around 7% and greater. The relatively large sample and small set of factors gives a high degree of confidence in the statistical power of regression analysis.

Sample size also affects the extent to which results can be generalised. The sample becomes more representative of the population as its size increases. Hair *et al.* (1998) suggest that, assuming a representative sample, the ratio of observations to independent variables should always be greater than 5-to-1 and ideally between 15 and 20-to-1. If *stepwise* regression is applied they argue that the ratio should be closer to 50-to-1. In this research, the ratio of observations to independent variables is 45.67-to-1.

The results of the analysis of variance (*ANOVA*) are summarised in **table 49**. The output for the regression displays information about variation accounted for by the four-factor regression solution. Residual output shows information regarding unaccounted variation. A comparison of the regression sum of squares and the residual sum of squares indicates that the model accounts for significant amount variation in the dependent variable. The F-statistic is the regression mean square (*MSR*) divided by the residual mean square error (*MSE*). The small significance value of this statistic indicates that the independent variables (*EPQ* factors) do a good job explaining variation in the dependent variable (*OEPQ Rating*).

Table 49. *EPQ* Regressions *ANOVA*

	Sum of Squares	df	Mean Square	F	Sig.
Regression *(a)(b)*	237.155	4	59.289	84.121	.000(d)
Residual	189.593	269	.705		
Total	426.748	273			

a Predictors: (Constant), Professionalism, Processing, Training, Specification
b Dependent Variable: *OEPQ Rating*

The coefficients for the estimated regression model are shown in **table 50.** The *t* statistics indicate the relative importance of each factor in predicting *OEPQ*. As a

guide, values less than -2 or greater than +2 are considered useful predictors. In this case, the most important predictor of *OEPQ Rating* is *Professionalism* (t = 6.885).

Table 50. *EPQ* Regression Coefficients

Model (a)	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.009	.091		66.020	.000
Professionalism	.359	.052	.387	6.885	.000
Processing	.244	.064	.209	3.790	.000
Training	.132	.039	.177	3.379	.001
Specification	.145	.051	.155	2.856	.005

a Dependent Variable: *OEPQ Rating*

Table 51 displays cases where the standardised residuals are more than 3 standard deviations away from the mean. In these cases, the regression model does not predict *OEPQ Ratings* accurately. Standardized residuals have a mean of 0 and a standard deviation of 1. The residual is the difference between the observed *OEPQ Rating* and the predicted value. In these cases the predicted *OEPQ Ratings*, based on responses to individual questions and factor scores, are significantly higher than actually given. This indicates that for these three cases, other variables not included in the *EPQ Scale* may by impacting on *Perceived EPQ*. Alternatively, the problem may be a result of errors in completing the questionnaire. However, for the vast majority of cases, the *EPQ* regression model has high levels of predictive power.

Table 51. *EPQ* Case-wise Diagnostics

Case Number	Std. Residual	*OEPQ*	Predicted Value	Residual
3	-3.494	2	4.93	-2.933
31	-3.705	2	5.11	-3.110
150	-3.480	2	4.92	-2.921

Dependent Variable: *OEPQ Rating*

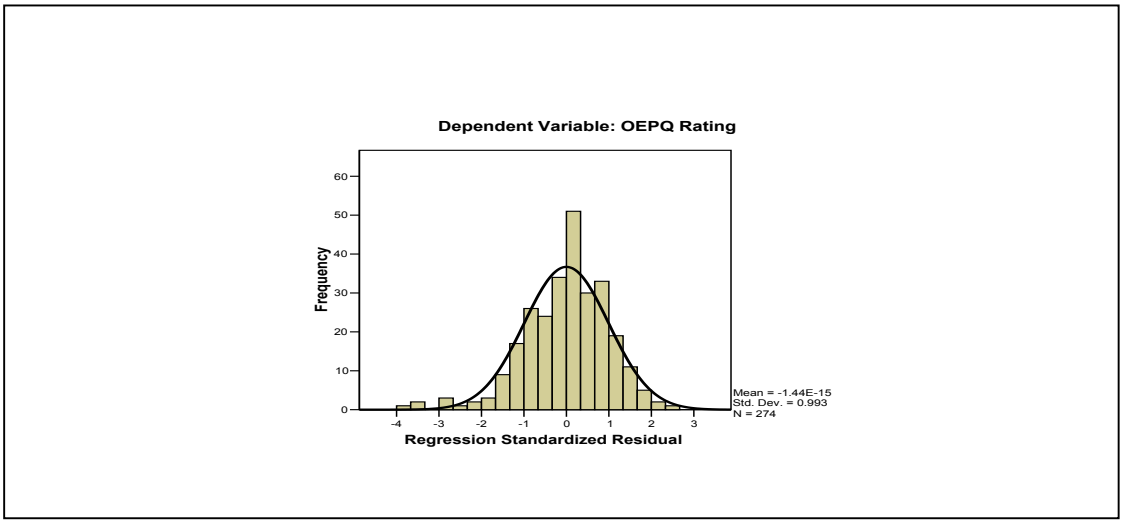
Table 52 displays residual and predicted value statistics for the *EPQ* Regression model. *OEPQ Ratings* predictions range from 2.07 to 6.78, with a mean of 4.81, based on the scores for the four factors in the regression model. The residuals range from 3.136 to 2.052. If the model is appropriate for the data, the residuals should follow a normal distribution. **Figure 34** indicates that this is the case for the data.

Table 52. *EPQ* Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.07	6.78	4.81	.936	274
Residual	-3.136	2.052	.000	.828	274
Std. Predicted Value	-2.919	2.106	.000	1.000	274
Std. Residual	-3.744	2.449	.000	.989	274

Dependent Variable: *OEPQ Rating*

Figure 34. Histogram of *EPQ* Residuals



6.2.5 Validation Conclusion

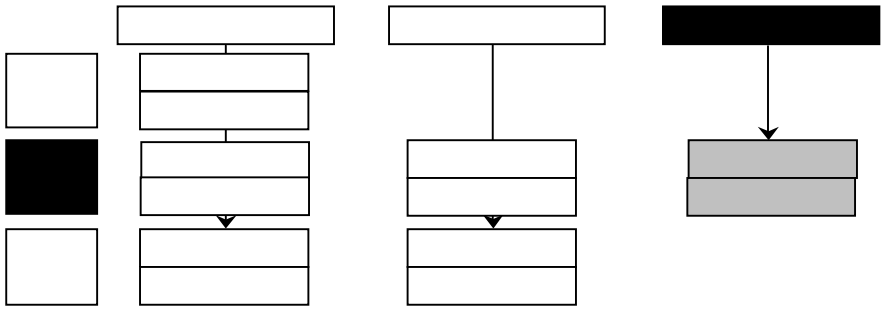
Table 53 details the key findings from the scale validation process. Reliability and validity tests indicate that the *EPQ Scale* appears to be a robust measure of *Perceived EPQ*. Internal reliability for the *EPQ Scale* is clearly demonstrated by Cronbach Alpha scores and item-to-total correlations. Content validity is demonstrated by the way in which the scale has been explicated and the review of experts in the field. Construct validity is demonstrated by the high level of correlation between independent measures of *Perceived EPQ*, in addition to the convergence and discrimination of items in the solution. Finally, predictive validity is established by how effectively the *EPQ Scale* is able to predict variance in *OEPQ Ratings* and by the relatively low level of unexplained variance in *ANOVA* of residuals. However, scale validation is clearly an ongoing process (Peter & Churchill, 1986). Therefore, further replications are needed in order to make stronger claims regarding both the reliability and validity of the scale. Having validated the *EPQ Scale*, the next section examines

the relative merits of a paired-statement and a single-statement approach in operationalising *Perceived EPQ*.

Table 53. *EPQ Scale* Validation Summary

Reliability	*EPQ Scale* Statistics / Notes
Factor Alpha Range	.751 - .954
Scale Alpha	.949
Item-to-total Average	.716
Content Validity	High
Construct Validity	
Variables included in Factor Solution	30 of 33
Average Loading on Assigned Factor	.726
Variables Loading on Single Factor	90.91%
Predictive Validity	
Regression – *EPQ Score* to *OEPQ*	Adjusted R^2 .486
Regression – Six Factors to *OEPQ*	Adjusted R^2 .551
Regression – Stepwise Factors to *OEPQ*	Adjusted R^2 .549
ANOVA of Residuals (Unaccounted Variation)	189.59 from 426.75

6.3 Comparing Perceived EPQ Operationalisations



As highlighted in the diagram above, this section uses data from *Phase 3* to examine *Research Question 3*. In developing a robust scale for measuring *Perceived EPQ*, it is important to explore alternative construct operationalisations. Because this study explores an area with little prior knowledge of internal customer expectations, it was decided to collect both expectations and perceptions data – a paired-statement approach (cf. Carman, 1990). However, if expectations ratings exhibit low variation, a single-statement approach may be considered for future research. This section compares the existing paired-statement approach for *EPQ Scale* calculation with a

single-statement approach. The debates in the literature concerning the two methods are examined earlier in the thesis (Section 2.2.8). However, a brief review of these debates is provided below. This is followed by factor analysis using 'perceptions-only' scores and validation of the resulting *EPQ* solution. Conclusions between the two alternative operationalisations are then drawn.

6.3.1 Recap of Debates

The *EPQ Scale* measures *Perceived EPQ* as the difference between internal customer expectations and perceptions of e-procurement delivery. Whilst it is argued that this is appropriate at a theoretical level, there are concerns over the operational value of difference scores (cf. Carman, 1990; Babakus & Boller, 1992; Cronin & Taylor, 1992, 1994; Brown *et al.* 1993; Iacobucci *et al.* 1994; Van Dyke *et al.* 1997). Critiques argue that in most cases, a paired-statement approach does not provide significant additional information beyond that in a single-statement approach.

There are a number of potential problems with the expectations element of the *EPQ Scale*. Because many expectations variables are vector attributes (i.e. more is always better), there is a tendency towards extreme responses (Van Dyke *et al.* 1997). Additionally, bias towards 'social desirability' may be created by the "I-have-high-expectations' social norm (Babakus & Inhofe, 1991). As a result, expectations scores may be illusory, in that the likely response to statements is 'strongly agree' (Carman, 1990; Reynoso & Moores, 1995; Babakus & Boller, 1992). The tendency to rate expectations consistently highly means that perception scores are often the dominant contributor to gap scores (Babakus & Boller, 1992; Boulding *et al.* 1993; Brown *et al.* 1993; Cronin & Taylor, 1992 & 1994;).

In examining the data from this research one can see the potential extent of this problem **(Table 54).** Of the 30 variables retained in the *EPQ Scale*, none have an expectations mean below 5.5, with an average of 6.43 on a 1-7 Likert scale. The limited variation in *EPQ* expectation scores means perceptions scores are the dominant component in *EPQ Scores* for this data set.

Table 54. *EPQ* Expectations

Item	Mean	Item	Mean
(E)* system security	6.73	(E) timely training	6.53
(E) orders to suppliers	6.72	(E) on-time delivery	6.46
(E) system navigation	6.69	(E) order lead-time	6.42
(E) ease of authorisation	6.69	(E) friendliness	6.38
(E) order processing	6.69	(E) confidentiality	6.35
(E) appropriate training	6.65	(E) support availability	6.33
(E) support reliability	6.62	(E) support flexibility	6.30
(E) invoice reconciliation	6.61	(E) FMS integration	6.29
(E) system availability	6.59	(E) processing service orders	6.29
(E) ease of search	6.56	(E) information provision	6.27
(E) problem resolution	6.55	(E) loaded suppliers	6.15
(E) order accuracy	6.54	(E) concern shown	6.13
(E) screen loading	6.54	(E) reporting capability	6.09
(E) knowledge	6.54	(E) system configurability	5.88
(E) support responsiveness	6.53	(E) loaded catalogues	5.69

* (E): Expectation Scores for *EPQ* Variables

In critiquing the *SERVQUAL* scale, Babakus and Boller (1992) argue that the correlations between *SERVQUAL* and dependent variables are simply weaker versions of the correlations between perceptions and these dependent variables. Even Parasuraman *et al.* (1993) accept that the predictive power of perceptions-only scores is usually higher than that of difference scores. As a result of concerns regarding the value of gap scores, some authors propose performance-only measures of service quality (Cronin & Taylor, 1992, 1994; Babakus & Boller, 1992; Reynoso & Moores, 1995; Bruhn, 2003).

The question is, 'what additional information do difference scores provide over and above perceptions scores?' Whilst accepting the improved predictive power of performance-only measures of service quality, some authors suggest that this improvement comes at the cost of *diagnostic value*. Using difference scores pinpoints areas of deficiency within an organisation (Pitt *et al.* 1995, 1997; Dean, 1999). Furthermore, Parasuraman *et al.* (1994b) argue that evidence from a number of authors shows an upward bias in direct measures of service quality compared with difference-score measures.

6.3.2 Single-Statement *EPQ* Factor Analysis

Factor analysis of *EPQ* perceptions scores is undertaken in order to assess the relative merits of the two construct operationalisations. To ensure a fair comparison between the two options, the factor analysis process needs to be the same. Therefore, identical choices have been made regarding method selection, factor design, assumption testing, retention of factors, extraction, rotation, interpretation, scale purification, creation of summated scales, and validation**. Table 55** summarises the final factor solution derived *EPQ* perceptions scores. The procedure results in an identical six-factor solution. Moreover, all the perceptions variables load on the same factors as their corresponding gap variables. With the exception of one additional item – *order accuracy* – all variables loaded on a single factor.

Table 55. Single-Statement *EPQ* Factor Solution

Variable	Professionalism	Processing	Training	Specification	Content	Usability
support availability	.808					
support reliability	.883					
support responsiveness	.916					
knowledge	.893					
support flexibility	.749					
problem resolution	.783					
confidentiality	.851					
friendliness	.923					
concern shown	.956					
order processing		.738				
ease of authorisation		.565				
orders to suppliers		.972				
order lead-time		.754				
processing complex orders		.428				
On-time delivery		.689				
order accuracy		**.494**		**.421**		
system security		.530				
timely training			.902			
appropriate training			.989			
information provision			.678			

FMS integration				.605		
invoice reconciliation				.680		
system configurability				.619		
reporting capability				.662		
loaded suppliers					.853	
loaded catalogues					.920	
ease of search					.705	
system availability						.547
screen loading						.860
system navigation						.493

Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.
Rotation converged in 7 iterations. All loadings <.35 omitted based on significance criterion

6.3.3 Single-Statement *EPQ Scale* Validation

The single-statement *EPQ Scale*, based on perceptions scores, is assessed for its reliability and validity in the same way as for gap scores.

Single-Statement EPQ Reliability

Table 56 shows the original and standardised reliability alphas for each factor and the entire scale. Internal reliability is indicated by Alpha coefficients which range from .780 to .966 for the six factors and .958 for the *EPQ Scale*. These coefficients represent a marginal improvement on the gap-approach. Internal consistency of the factor solution is also indicated by the item-to-total scores **(Table 57).** Again, the solution based on perceptions-only scores has very slightly higher item-to-total scores than the gap-approach solution.

Table 56. Single-Statement *EPQ* Cronbach Alphas

Factor	No. Items	Un-standardised Cronbach	Standardised Cronbach
Professionalism	9	.965	.966
Processing	8	.909	.910
Training	3	.930	.930
Specification	4	.845	.846
Content	3	.859	.862
Usability	3	.778	.790
EPQ Scale	30	.958	.958

Table 57. Single-Statement *EPQ* Item-to-Totals

Variable	Item-to-total	Variable	Item-to-total
support availability	.838	timely training	.866
support reliability	.859	appropriate training	.916
support responsiveness	.905	information provision	.795
Knowledge	.891		
support flexibility	.809		
problem resolution	.856	FMS integration	.651
Confidentiality	.864	invoice reconciliation	.735
friendliness	.819	system configurability	.657
concern shown	.858	reporting capability	.692
order processing	.745	loaded suppliers	.738
ease of authorization	.669	loaded catalogues	.785
orders to suppliers	.812	ease of search	.685
order lead-time	.765		
processing service orders	.649	system availability	.605
on-time delivery	.766	screen loading	.647
order accuracy	.661	ease of navigation	.600
system security	.608		

Single-Statement EPQ Content Validity

Content validity can be seen as the same for the two approaches as they produce almost identical scales. Content validity is demonstrated by the procedures used in developing the variables, detailed earlier in the thesis. The attention to key literatures, qualitative research, and judgement by experts, all point to content validity criteria being met.

Single-Statement EPQ Construct Validity

In terms of construct validity, the rules of variable convergence and discrimination (Bagozzi, 1981) hold good for the perceptions-only data. Of the original 33 variables, 29 have high loadings on a single factor **(Table 55).** In addition, the scale exhibits high Alphas **(Table 56)** and high item-to-total scores **(Table 57)**.

Single-Statement EPQ Predictive Validity

Multiple regression analysis is applied to assess the predictive validity of the perceptions-only *EPQ Scale.* Initially, regression is carried out between the *EPQ Score* (Average of 6 *EPQ* factors, based on perceptions data) the *OEPQ Rating*

(Table 58). 59% of variance in the *OEPQ Rating* is explained by the *EPQ Score*. This compares with 48.6% of variance explained by the gap-approach *EPQ Score.*

Table 58. Linear Regression: Single-Statement *EPQ* to *OEPQ Rating*

Model *(b)*	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.769(a)	.592	.590	.800

a Predictors: (Constant), *PEPQ*
b Dependent Variable: *OEPQ Rating*

Multiple regressions indicate that the six perceptions-only *EPQ* factors predict 66.5% (Adjusted R^2 = .665) of variance in the *OEPQ Rating* **(Table 59)**, compared with 55.1% prediction for the combination of all gap-approach factors.

Table 59. Linear Regression: Single-Statement *EPQ* Factors to *OEPQ Rating*

Model *(b)*	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.820(a)	.673	.665	.723

a Predictors: (Constant), PUsability, PTraining, PContent, PSpecification, PProfessionalism, PProcessing
b Dependent Variable: *OEPQ Rating*

Step-wise multiple regressions suggest that the best solution has five factors explaining 66.5% of variance in *OEPQ Ratings* **(Table 60).** This compares with the four-factor solution explaining 54.9% of variance in the paired-statement approach solution.

Table 60. Stepwise Regression: Single-Statement *EPQ* Factors to *OEPQ Rating*

Model *(f)*	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.760(a)	.578	.576	.814
2	.798(b)	.637	.635	.756
3	.810(c)	.657	.653	.737
4	.816(d)	.666	.661	.728
5	.819(e)	.671	.665	.724

a Predictors: (Constant), PProfessionalism
b Predictors: (Constant), PProfessionalism, PSpecification
c Predictors: (Constant), PProfessionalism, PSpecification, PTraining
d Predictors: (Constant), PProfessionalism, PSpecification, PTraining, PProcessing
e Predictors: (Constant), PProfessionalism, PSpecification, PTraining, PProcessing, PContent
f Dependent Variable: *OEPQ Rating*

ANOVA results for the five-factor regression solution are shown in **table 61.** The residual output indicates the level of unaccounted variation. A comparison of the

regression sum of squares and the residual sum of squares indicates that the model accounts for significant amount variation in the dependent variable. The residual output for the single-statement solution is also lower than for the paired-statement approach – 140.337 compared to 189.593, indicating a lower level of unexplained variance in the data. The small significance value of the *F* statistic indicates that the factors do a good job explaining the variation in *OEPQ Ratings*.

Table 61. Single-Statement *EPQ ANOVA*

	Sum of Squares	Df	Mean Square	F	Sig.
Regression *(a) (b)*	286.411	5	57.282	109.391	.000(e)
Residual	140.337	268	.524		
Total	426.748	273			

a Predictors: (Constant), PProfessionalism, PSpecification, PTraining, PProcessing, PContent
b Dependent Variable: *OEPQ Rating*

Table 62 summarises the regression coefficients for the estimated regression model. The most important predictor of *OEPQ Rating* is *PProfessionalism*, with a *t* value of 9.399.

Table 62. Single-Statement *EPQ* Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.048	.234		-.203	.839
PProfessionalism	.465	.050	.474	9.399	.000
PSpecification	.150	.053	.151	2.845	.005
PTraining	.136	.037	.170	3.684	.000
PProcessing	.138	.064	.118	2.170	.031
PContent	.085	.042	.092	2.031	.043

Dependent Variable: *OEPQ Rating*

Cases where the regression model fails to accurately predict *OEPQ Ratings* are displayed in **table 63.** Four cases from the sample of 274 internal customers have standardised residuals that are more than 3 standard deviations away from the mean. Anomalies may occur through errors in questionnaire completion or because other variables not included in the scale are impacting on *OEPQ Ratings* in these few cases. For the vast majority of cases, the single-statement regression solution accurately predicts the dependent variable.

Table 63. Single-Statement *EPQ* Case-wise Diagnostics

Case Number	Std. Residual	*OEPQ*	Predicted Value	Residual
3	-3.509	2	4.54	-2.539
115	-3.330	1	3.41	-2.410
150	-4.256	2	5.08	-3.080
203	-3.743	1	3.71	-2.709

Dependent Variable: *OEPQ Rating*

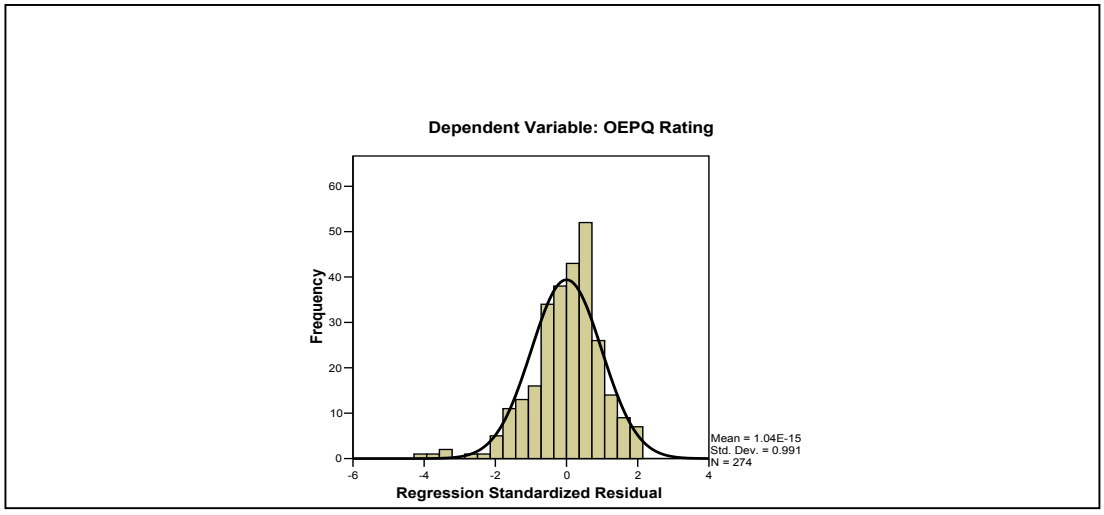
Table 64 displays residual and predicted value statistics for the regression model. *OEPQ* value predictions range from 1.60 to 6.73, with a mean of 4.81, based on the scores for the five factors in the regression model. The residuals range from -3.080 to 1.500. These residual scores also follow a normal distribution **(Figure 35)**, as would be expected if the regression model is appropriate for the data.

Table 64. Single-Statement *EPQ* Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.60	6.73	4.81	1.024	274
Residual	-3.080	1.500	.000	.717	274
Std. Predicted Value	-3.133	1.874	.000	1.000	274
Std. Residual	-4.256	2.073	.000	.991	274

Dependent Variable: *OEPQ Rating*

Figure 35. Histogram of Single-Statement *EPQ* Residuals



6.3.4 Conclusion on *Perceived EPQ* Operationalisation

The various tests carried out indicate that basing *Perceived EPQ* measurement on either a paired-statement or a single-statement approach produce scales with high

levels of reliability and validity **(Table 65).** However, it is clear that in many areas the single-statement *EPQ Scale* does outperform the paired-statement scale. Whilst the improvements in reliability and validity statistics are generally marginal, one must also consider the increased length of the paired-statement approach when assessing the two options.

Table 65. *EPQ Scale* Validation: Paired-Statements vs. Single-Statements

Paired-Statement *EPQ Scale*		**Single-Statement *EPQ Scale***
	Reliability	
.751 - .954	Factor Alpha Range	.780 - .966
.949	Scale Alpha	.958
.716	Item-to-total Average	.758
High	**Content Validity**	High
	Construct Validity	
30 of 33	Variables included in Factor Solution	29 of 33
.726	Average Loading on Assigned Factor	.748
90.91%	Variables Loading on Single Factor	87.9%
	Predictive Validity	
Adjusted R^2 .486	Regression – *EPQ* Score to *OEPQ*	Adjusted R^2 .590
Adjusted R^2 .551	Regression – Six Factors to *OEPQ*	Adjusted R^2 .665
Adjusted R^2 .549	Regression – Stepwise Factors to *OEPQ*	Adjusted R^2 .665
189.59 from 426.75	ANOVA of Residuals (Unaccounted Variation)	140.34 from 426.75

Managers must consider the data richness and diagnostic value of the paired-statement approach compared with the marginally higher reliability, validity and collection efficiencies gained from single-statement data. In cases where expectations are perceived as relatively stable, it may be appropriate to measure expectations separately as little as once every three years (Carman, 1990).

Simply using the perceptions section of the current *EPQ Scale* in a single-statement approach may not be the most appropriate way to operationalise *Perceived EPQ*. In advocating the single-statement approach, a number of authors suggest it is better to re-word statements to explicitly consider the perceptions-expectations gap (Carman, 1990; Babakus & Boller, 1992; Reynoso & Moores, 1995). **Figure 36** illustrates how paired-statements in the current *EPQ Scale* could be re-written as single statements.

Figure 36. *EPQ* Question Modification

	Well below my expectations						**Well above my expectations**
The availability of the system.	1	2	3	4	5	6	7
The speed of screen loading.	1	2	3	4	5	6	7

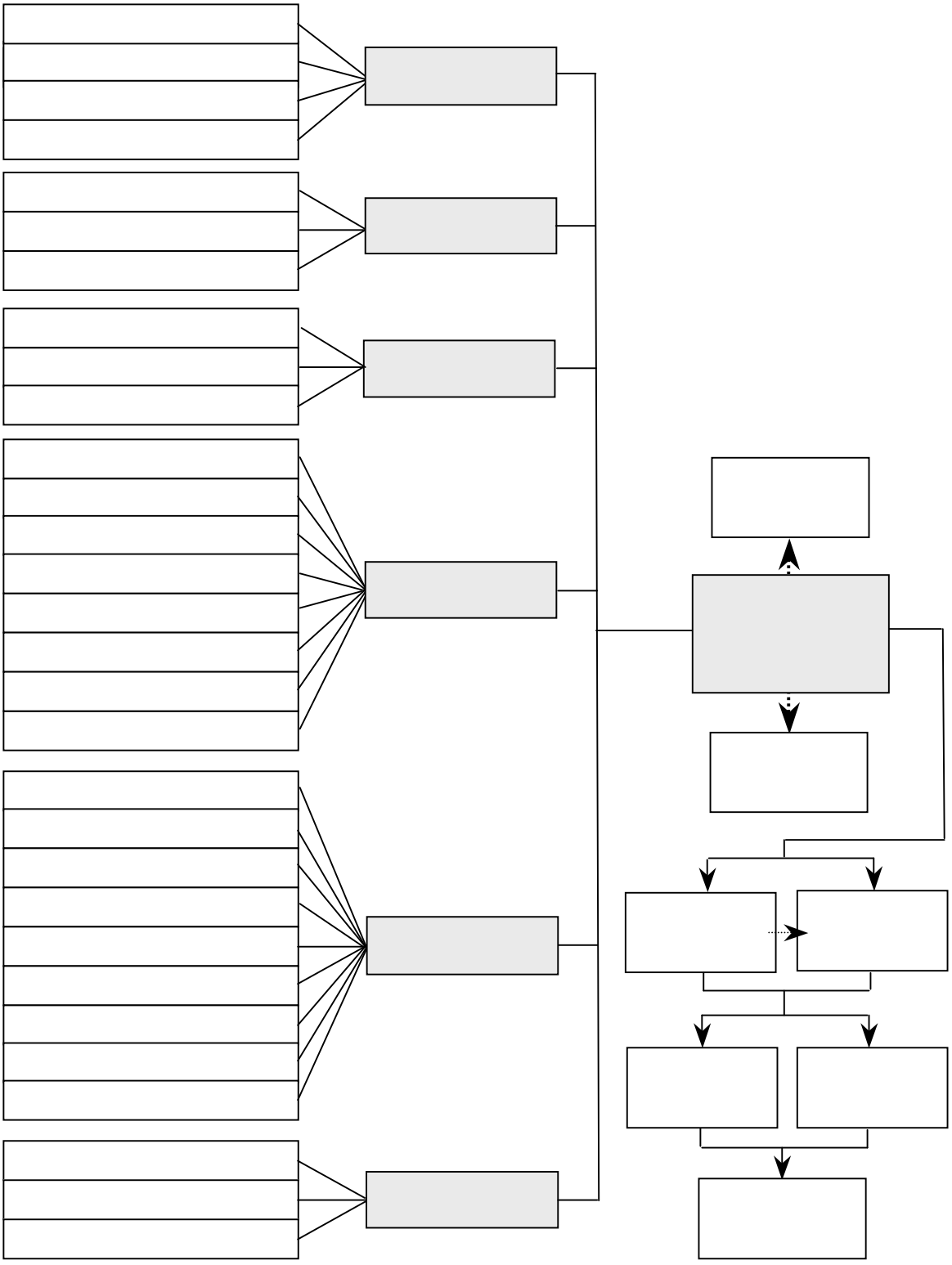
As discussed previously, the choice between the paired-statement approach and single-statement approach is a difficult one. If the decision is taken not to measure *EPQ* expectations separately, it may be better to adopt the re-written single statements simply use the perceptions half of original paired statements. This is because single 'perceptions-expectations' statements explicitly consider the theoretical underpinnings of *Perceived EPQ*.

Summary

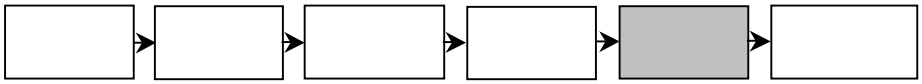
This chapter has presented empirical analysis of questionnaire data from *Phase 3* of the study. The aim of this phase has been to examine the structure of *Perceived EPQ*, to validate the proposed *EPQ Scale*, and to assess alternative ways to operationalise construct measurement. Factor analysis has been applied to examine the structure of *Perceived EPQ*. Reliability and validity tests suggest that the *EPQ Scale* is a robust measure of *Perceived EPQ*. Finally, the current paired-statement method of scale calculation has been compared with a single-statement approach. Both construct operationalisations produce robust scales, so one must consider diagnostic value and efficiency of the measures. It is argued that is may be more appropriate to measure the perceptions-expectations gap directly if adopting a single-statement approach. **Figure 37** shows the revised *EPQ Model* in light of *Phase 3* data analysis.

In order to make stronger claims regarding value of the *EPQ Scale* in measuring *Perceived EPQ*, it is proposed that replication is necessary (cf. Yin, 1994). The next chapter presents some research work that seeks to refine the scale, through replication work in a different organisational setting.

Figure 37. ***EPQ Model*** **(Post-** ***Phase 3*** **Analysis)**



Chapter 7: Replication Study Empirical Analysis



This chapter presents empirical analysis from the replication study. Having examined *Perceived EPQ* in depth in one e-procurement setting (4 cases in the U.K) and developed a construct measure, it is important to assess how well the findings stand up in a new environment. As noted in section 4.7 Yin (1994) argues that in order to test theories, replication in similar contexts is necessary. Whilst data analysis indicates high levels of reliability and validity, scale development is clearly an ongoing process (Doll *et al.*, 1994). The replication in Holland is focused on assessing the applicability of the *EPQ Scale* in a different e-procurement context and on suggesting any areas for improvement. This work is used to identify items, factors, and factor loadings that may be specific to the context in which the original scale has been developed, and to propose improvements to the measure.

The chapter begins by detailing pre-analysis tests and is followed by the factor analysis results. Validation efforts consider the reliability and validity of three different *EPQ Scale* options – the original U.K. scale, the Dutch scale, and a 'robust' scale comprising only the 19 items that load on the same factors across both studies. On the basis of data analysis, modifications to the *EPQ Scale* are suggested and conclusions drawn.

7.1 Replication Pre-Analysis Results

T-tests comparing the responses of early and late respondents find no significant differences between the means of the two groups for a *EPQ* variables. Therefore, it is likely that the views of respondents and non-respondents are similar. Considering missing data, patterns in the 'don't know / N.A' answers have been checked. Of the 154 respondents, 101 have missing data for the item *'ability to process complex orders'*. Discussions with users indicate that few use the system to order complex services (e.g. social service packages). Where services are ordered, they tend to be highly commoditised (e.g. catering or printing services), so this item is inapplicable to

most respondents. Another four items, comprising the *Specification* factor have high levels of missing data: *'working alongside the FMS'* (96), *'reporting capability of the system'* (90), *'ease of invoice reconciliation'* (84), and *'ability to configure the system'* (70). These four characteristics are important in the U.K. setting, where budgets are a critical issue to local government. However, for operational users in the Dutch study (many with no awareness of budgets), they are only deemed applicable to a subset of high-level users.

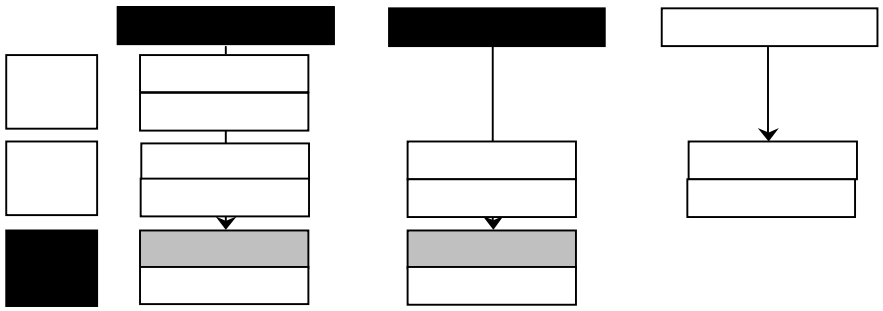
Having removed the five items with the highest proportions of missing data, the focus turns to respondents with high levels of missing data. Eleven respondents have missing data on more than half of the items. Another ten have missing data on all items related to e-procurement support (*Training* and *Professionalism* items). These twenty-one respondents are removed from the dataset because apparently, they consider themselves insufficiently experienced or otherwise capable of commenting on *Perceived EPQ*. On the basis of the 133 remaining respondents, a plot of the amount of missing data versus items ranked on their number of missing data from high to low, shows a steep decline in the proportion of missing data moving from the first item to the sixth, and a more gentle decline from item 7 onwards (much like a scree plot in factor analysis). The first five items with the largest number of missing values have already been already deleted, and this additional analysis leads to the removal of a sixth item *'confidentiality of support'*, an issue many respondents apparently feel they cannot comment upon.

This set of 133 cases still contains missing data. In fact, only 39 out of 133 cases are entirely complete. In order to decide how to treat the missing data, an analysis of missing data patterns is performed in *SPSS*. Group comparisons of respondents with missing versus valid data show a limited number of significant differences between the groups, indicating that simple mean substitution may not be the best method for replacing missing data. Therefore, the model-based expectation-maximisation approach is used to replace all remaining missing data points with the most accurate and reasonable estimate (Hair *et al.*, 1998).

Outlier testing has involved calculating respondent Mahalanobis Distances and checking standardised scores for exceptional values. Additionally, linear regression

has been run with all 24 items as independent variables and the *EPQ Score* as the dependent variable. The histogram and normality plot of standardised residuals and the scatter plot of standardised residuals versus standardised predicted values have also been analysed. Three cases have been identified as outliers and removed from the data set. There is no evidence of non-linearity or heteroscedasticity. Finally, all items have been checked for normality. All but one of the values for skewness and kurtosis is smaller than ± 2.0, the one exception still being smaller than ± 2.0.

7.2 Replication Factor Analysis



As highlighted in the diagram above, this section uses data from the replication study to examine *Research Questions 1* and *2*, through factor analysis. In order to make a fair comparison between the two sites, factor analysis has been undertaken in the same way as the original U.K. study. Given that the four *Specification* items have been removed prior to analysis, extraction has been constrained to five factors *a priori.* However, if is worth noting that using eigenvalues >1 as a rule for extraction also indicates a five-factor solution. Oblique rotation produces a solution that is easily interpretable. *'System security'* and *order accuracy'* have been excluded because of non-significant loadings in the factor matrix. The Dutch factor solution is shown in **table 66**.

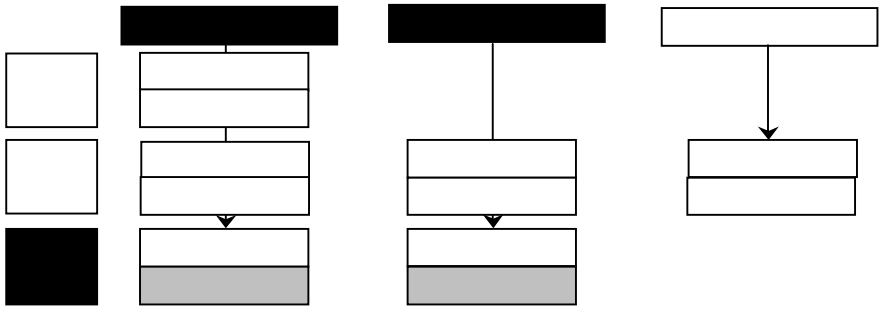
Table 66. *EPQ* Factor Solution for Replication Study

Item Name	Training	Professionalism	Processing	Content	Usability	Specification
appropriate training	.945					
timely training	.859					

problem resolution		.933				
concern shown		.904				
support reliability		.884				
knowledge		.875				
support flexibility		.858				
support availability		.843				
friendliness		.838				
support responsiveness		.835				
information provision *	(.529)	.811				
order processing			.944			
orders to suppliers			.759			
order lead time			.730			
on-time delivery			.715			
loaded catalogues				.900		
loaded suppliers				.619		
system navigation					.819	
ease of search *				(.523)	.794	
screen loading					.741	
ease of authorisation *			(.439)		.702	
system availability					.651	
Total Variance Explained = 78.32%		***Shared Variance Explained = 71.83%***				

Extraction: Principal Axis Factoring.
Rotation: Promax with Kaiser Normalization.
* Items that load on a different factor compared to the UK study

7.3 Replication Validation



This section uses data from *Phase 3* to examine *Research Questions 1* and *2*, thorough scale validation. In terms of essential content, both factor solutions lead to the same broad dimensions of *Perceived EPQ* - *Training, Professionalism, Content, Usability,* and *Processing*, whilst the original study has the additional *Specification* factor. The remaining issue is what items to include in the measurement scales for these quality dimensions. Analysis suggests a choice of three *EPQ Scales* of varied length **(Table**

67). First, there is the 30-item original study. Second, there is the 22-item scale derived from the factor analysis in the replication study and third, a 'robust' scale comprising only the 19 items that load on the same factors across both studies. The relative merits of the three options are now discussed, considering reliability and validity.

Table 67. *EPQ Scale* Options

EPQ Variables	UK 30-item	Dutch 22-item	'Robust' EPQ Variables	UK 19-item	Dutch 19-item
TRAINING			**TRAINING**		
appropriate training	.903	.896	appropriate training	.899	.896
timely training	.859	.896	timely training	.899	.896
information provision	.755	x		N/A	N/A
Alpha	**.919**	**.945**	***Alpha***	**.946**	**.945**
PROFESSIONALISM			**PROFESSIONALISM**		
support responsiveness	.869	.815	support responsiveness	.871	.818
knowledge	.840	.865	knowledge	.834	.857
confidentiality	.817	-		N/A	N/A
problem resolution	.824	.904	problem resolution	.814	.914
concern shown	.793	.871	concern shown	.782	.875
support reliability	.818	.868	support reliability	.821	.869
support availability	.807	.842	support availability	.814	.841
support flexibility	.791	.844	support flexibility	.787	.826
friendliness	.763	.808	friendliness	.755	.809
information provision*	N/A	.817		N/A	N/A
Alpha	**.954**	**.963**	***Alpha***	**.947**	**.961**
PROCESSING			**PROCESSING**		
orders to suppliers	.744	.656	orders to suppliers	.781	.656
order lead time	.756	.658	order lead time	.756	.658
order processing	.721	.836	order processing	.744	.836
on-time delivery	.724	.674	on-time delivery	.646	.674
ease of authorisation	.644	x		N/A	N/A
order accuracy	.636	/		N/A	N/A
processing complex orders	.608	-		N/A	N/A
system security	.574	/		N/A	N/A
Alpha	**.897**	**.857**	***Alpha***	**.872**	**.857**
CONTENT			**CONTENT**		
loaded catalogues	.689	.550	loaded catalogues	.656	.550
loaded suppliers	.666	.550	loaded suppliers	.656	.550
ease of search	.571	x		N/A	N/A
Alpha	**.796**	**.699**	***Alpha***	**.792**	**.699**
USABILITY			**USABILITY**		
system navigation	.565	.738	system navigation	.565	.672
ease of search*	N/A	.739		N/A	N/A
screen loading	.639	.651	screen loading	.639	.673
ease of authorisation*	N/A	.610		N/A	N/A
system availability	.539	.580	system availability	.539	.443

Alpha	**.751**	**.851**	***Alpha***	**.751**	**.758**
SPECIFICATION					
invoice reconciliation	.692	-		N/A	N/A
reporting capability	.674	-		N/A	N/A
FMS integration	.599	-		N/A	N/A
system configurability	.592	-		N/A	N/A
Alpha	**.818**	N/A		N/A	N/A
Total Scale Alpha	**.949**	**.930**	***Total Scale Alpha***	**.925**	**.918**

- \- Item deleted prior to data analysis
- / Item failed to load on any factor during analysis
- x Item did not load on hypothesised factor
- * EPQ item on factor for Dutch study

EPQ Scale Reliability

In the absence of *parallel forms* or *test-retest* reliability test, *EPQ Scale* reliability must be assessed by *internal consistency.* For the original 30-item the scale alpha is .949 and coefficients range from .751 to .954 for the six factors. In the Dutch study, the 22-item scale has high alphas, ranging from .699 to .963 for the five factors and .930 for the entire scale. The 'robust' *EPQ Scale* also performs well with coefficients from .751 to .947 when applied to the U.K. data, and from .699 to .961 for the Dutch data, whilst scale alphas are .925 and .918 respectively. Apart from one borderline score of .699 for the *Content* factor in both Dutch 22- and 19-item scales, all alpha coefficients exceed the recommended cut-off points of .60 and .70 (Nunally, 1978; Flynn *et al.,* 1990). Item-to-total correlations for the U.K. 30-item scale range from .539 to .903, whilst the Dutch 22-item scale range from .550 to .904. Across the two settings, the 19-item *EPQ Scale* has item-to-total scores between .443 and .899. The high scores for all three versions of the *EPQ Scale* provides further evidence of internal consistency. The differences between the reliability scores in the U.K. for the original 30-item *EPQ Scale* and the robust 19-item scale are marginal. There are improvements in both settings for some factors, as the original scale is replaced with the robust scale. However, it is worrying that two dimensions of *Perceived EPQ* (*Training* and *Content*) in the robust scale are measured by only two items. This may indicate the need to identify additional items for these factors.

EPQ Scale Content Validity

As noted in section 6.2.2, the original 30-item *EPQ Scale* has been assessed by a panel of expert judges, who consider it to adequately reflect the various facets of e-

procurement quality. However, the high level of missing data for six items in the Dutch study suggests that some variables may be context-specific. In particular, missing data for the four *Specification* items suggests that this factor may not be applicable in all e-procurement settings or users. Discussions with individuals in the Dutch study indicate that only those with budgetary control are concerned with how an e-procurement system works alongside their financial management system or with the ability to reconcile invoices through the system. Equally, reporting capabilities and system configurability appear to only be relevant to high-level users. In the U.K., local government is more accountable for its spending than universities. This is because they are perceived by the public to be spending 'their money' (Through taxation). As a result, e-procurement users in this setting are highly aware of budgets, the need for efficient payment, and the value of procurement reports. Additionally, the centrality of procurement may impact on the importance of *Specification.* Where procurement is governed by a central department, end-users may not have a great deal of concern with system integration, invoice reconciliation, configuration, or reporting capability. However, in cases where procurement is more devolved, these issues may be more important. Whilst the *Specification* factor should not be ignored when assessing *Perceived EPQ*, it may apply to a select group of internal customers in some cases.

The *ability to process complex orders* also appears to have limited applicability to some e-procurement contexts. Some services are similar to commodity items (e.g. catering, training programmes or agency staff) and as such present few new system challenges. However, this item is concerned with how an e-procurement system deals with the more complex services (e.g. social services, care provision or welfare), where discrepancies between order requisitions and invoices are common. Some e-procurement systems will allow a 'zone of tolerance' when matching invoices and requisitions, whilst others use 'call-off contracts' to deal with service orders that are time/cost uncertain. As such, it is likely to apply to a sub-set of e-procurement users. Finally, *confidentiality of support* causes problems in the replication study, with high levels of missing data. In the literature, confidentiality is concerned with the privacy with which individual dealings are treated. Although confidentiality may be an important aspect of *Perceived EPQ*, it may be difficult for many users to evaluate this variable.

EPQ Scale Construct Validity

In order to assess *discriminant validity*, correlation matrices for the three scale options have been analysed. With very few exceptions, correlations between items within a factor are higher than correlations between items across factors. The first assessment of *convergent validity* examines the extent to which variables in the replication study load on their hypothesised factors. Of the 24 items used in the Dutch analysis, 19 (79%) load on the same factor as the original *EPQ Scale*. *Information provision*, *ease of search* and *ease of authorisation* do not load as expected, whilst *system security* and *order accuracy* fail to load sufficiently on any factor. These incongruities are discussed in turn.

Information provision loads on *Training* in the U.K. factor solution, but on *Professionalism* in the factor analysis of the Dutch data. The *secondary* loading for this item is *Professionalism* for the U.K. and *Training* in Holland. This indicates that provision of information can relate to support provided prior to adoption and to ongoing support. If the item is interpreted as factual information about the system to aid learning prior to adoption, it is likely to correlate with *Training* items. If it is interpreted as information provided to answer queries, then it is likely to correlate with *Professionalism* items.

Ease of search loads on the *Content* factor in the U.K. data, but on the *Usability* factor in the Dutch data. In the U.K. setting, the *ease of search* closely relates to *Content* items - i.e. you can't use the search because there are insufficient suppliers or catalogues loaded on the system and vice versa. However, the item can also be interpreted as an aspect of *Usability*, in terms of a good search function being part of a system designed for easy use. In the U.K. data, the third-highest loading of *ease of search* is *Usability*, and in the Dutch data, its second-highest loading is on *Content*.

Ease of authorisation loads on *Processing* in the U.K. data, but on *Usability* in the Dutch data. If *ease of authorisation* is interpreted as the speed with which others in the order fulfilment process authorise an order, it should correlate with the *Processing* items. However, if it is interpreted as the efficiency with which the system authorises

the user's input, it may correlate with the *Usability* items. The second-highest loading of *ease of authorisation* in the U.K. data is on *Usability*, while its second-highest loading in the Dutch data is on *Processing*.

System security and *order accuracy* both had non-significant loadings. Given the fact that these two items had relatively low levels of missing data, it is clear that they are relevant to e-procurement users in both research settings. However, the fact that the items fail to load sufficiently on a single factor suggests that different users may apply different meanings to the items. Considering *system security*, some users may consider financial issues (e.g. protection from fraud / budgetary misuse), some to non-financial concerns (e.g. privacy of information), and others to the impact of security functions on order processing (e.g. auto-logout). The different perspectives mean that the variable is prone to load on more than one factor. One might consider re-wording/splitting this item to ensure perceptions relate to the same aspect of security.

Order accuracy is also important to e-procurement users across different settings. One would expect this variable to naturally fall into the *Processing* factor, but it does not load sufficiently in the Dutch solution. A key problem for the item is that some users may see order accuracy as an element within e-procurement, whilst others may perceive it as a supplier issue – i.e. however good your e-procurement is you can still have the wrong goods/services delivered by the supplier. To reflect the fact that both the system and suppliers affect the accuracy of orders, this item may also need to be re-worded.

The high number of items loading as hypothesised provides strong evidence of construct validity for the original *EPQ Scale*. Whilst there are some item shifts between the two settings, this should not cause major concern, as the essential content of the factors is the same across studies. *Training* items relate to the quality of support provided before system implementation. *Professionalism* is concerned with the quality of ongoing support provided when users run into problems. *Content* items are concerned with the extent to which appropriate suppliers and catalogues are loaded on the system. *Usability* focuses on system availability, screen loading, and navigation, whilst *Processing* items consider the impact of e-procurement on the order fulfilment process.

Convergent validity is established when scores from other construct measures correlate with those of the scale (Parasuraman *et al.,* 1988; Pitt *et al.,* 1995; Sekaran, 2003). Convergent validity is assessed by examining the correlation between *EPQ* factors, the *EPQ Score*, and the *OEPQ Rating* **(Table 68)**. The high correlations between the measures in both settings indicate the convergent validity of the all three *EPQ Scale* options. Though all correlations are significant at the .01 level, the correlation coefficients for the *Content* factor is low, especially for the 19-item robust scale in both the U.K. and the Dutch setting.

Table 68. Correlations between *EPQ* factors, *Composite EPQ* and *OEPQ Ratings*

	OEPQ Rating	***EPQ Score***	***Training***	***Professionalism***	***Processing***	***Content***	***Usability***	***Specification***
OEPQ Rating	1	.559**	.283**	.336**	.367**	.416**	.655**	x
		.520**	.283**	.306**	.367**	.416**	.627**	x
EPQ Score	.698**	1	.648**	.859**	.712**	.536**	.769**	x
	.717**		.630**	.819**	.722**	.560**	.745**	x
Training	.549**	.701**	1	.594**	.259**	.198**	.360**	x
	.524**	.662**		.580**	.259**	.198**	.423**	x
Professionalism	.669**	.756**	.623**	1	.454**	.275**	.465**	x
	.666**	.755**	.579**		.441**	.267**	.410**	x
Processing	.561**	.779**	.379**	.478**	1	.437**	.476**	x
	.535**	.717**	.324**	.416**		.437**	.429**	x
Content	.397**	.706**	.270**	.351**	.513**	1	,419	x
	.321**	.629**	.178**	.335**	.396**		.362**	x
Usability	.414**	.762**	.401**	.443**	.596**	.480**	1	x
	.414**	.762**	.400**	.442**	.551**	.400**		x
Specification	.527**	706**	.332**	.463	.641**	.479**	.558**	1
	x	x	x	x	x	x	x	x

** Significant at the .01 level (two-tailed)
Below diagonal: First line original *EPQ* / UK data; second line robust *EPQ* / UK data
Above diagonal: 1st line adapted *EPQ* / Dutch data; 2nd line robust *EPQ* / Dutch data

EPQ Predictive Validity

Regressions have been carried out for each scale option between the *EPQ Score* and the *OEPQ Rating* **(Table 69).** For the U.K. data, the predictive power of the *EPQ Score* based on the 19 'robust' items is marginally better than from the original 30

items (R^2 .513 compared with R^2 .486). For the Dutch data, the *EPQ Score* explains 32% of variance in *OEPQ Ratings* using the 22-item scale and 31% using the robust 19-item scale.

Table 69. Linear Regression Across Settings: *EPQ Score* to *OEPQ*

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
Original *EPQ Scale* in UK setting	.698	.487	.486	.897
Robust *EPQ Scale* in UK setting	.717	.515	.513	.873
Adapted *EPQ Scale* in Dutch setting	.570	.325	.320	.937
Robust *EPQ Scale* in Dutch setting	.561	.315	.310	.944

Predictors: (Constant), *EPQ Score*
Dependent Variable: *OEPQ Rating*

Subsequently, multiple regressions have been undertaken between the *EPQ* factors and the *OEPQ Rating* **(Table 70).** For the U.K data, the combination of six factors in the original EPQ scale predicts 55.1% of variance in the *OEPQ Rating*, while the five factors of the robust *EPQ Scale* still predict 53.6% of variance. The predictive validity of the scale is marginally worse for the Dutch data set – the adapted *EPQ Scale* predicts 43.3% of variance, while the 'robust' *EPQ scale* predicts 41.4% of variance. Not all factors have a significant coefficient in the regression model. In the original study, *Content* and *Usability* factors have non-significant coefficients, in the Dutch study only these two factors have significant coefficients in the regression model. This indicates that *OEPQ Ratings* of users in different settings may be dominated by different dimensions of *Perceived EPQ*. It also suggests that some factors may dominate at different points of implementation. For example, *Training* perceptions may become less important over time, whilst *Specification* items increase in relevance as users seek to adopt more advanced e-procurement tools such as reporting, e-invoicing, or e-payment.

Table 70. Regression Across Settings: *EPQ* Factors to *OEPQ Rating*

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
Original EPQ scale in UK setting [a]	.749	.561	.551	.838
Robust EPQ scale in UK setting [b]	.738	.545	.536	.852
Adapted EPQ scale in Dutch setting [b]	.675	.455	.433	.855
Robust EPQ scale in Dutch setting [b]	.661	.437	.414	.870

a Predictors: (Constant), Usability, Training, Content, Specification, Professionalism, Processing

b Predictors: (Constant), Usability, Training, Content, Professionalism, Processing
Dependent Variable: OEPQ Rating

7.4 Modifying the *EPQ Scale*

It is clear that the majority of items identified in the original study are relevant to the replication study. Of the 24 items used in the Dutch factor analysis, 19 (79%) load identically to the original *EPQ Scale*. Where 3 items have shifted between factors, there are obvious and logical explanations. In addition, the possibility of multiple interpretations for the two items that failed to load sufficiently on any factor has been discussed. However, one concern is that the 19-item 'robust' scale has two factors with just two items each – *Training* and *Content.* In addition, *Usability* is comprised of only three items. Additional items for these three factors may be beneficial in developing a better *EPQ Scale*. An obvious first step is to assess the five items not loading as hypothesised in the replication study.

Information provision is interpreted as an aspect of *Training* in the UK and *Professionalism* in the Dutch study. This problem may be resolved by re-wording/splitting as follows:

	Well below my expectations						**Well above my expectations**
The provision of information about the e-procurement system prior to implementation	1	2	3	4	5	6	7
The ongoing provision of information about the e-procurement system	1	2	3	4	5	6	7

In addition the two other items in the *Training* factor (*timely training* and *appropriate training*) could be divided into more specific aspects of user guidance in the first stages of adoption, such as training manuals, quick guides, facilities for self-learning, and information sessions. These sub-groups link to the original open codes generated in *Phase 1*, prior to axial coding (**Table 24)**. *Ease of search* loads on *Content* in the UK, but *Usability* in the Dutch study. The item currently reads *'the e-procurement system allows easy searching for suppliers or items'*. It may be possible to split the item as follows.

	Well below my expectations						**Well above my expectations**
The ease of searching for items in catalogues	1	2	3	4	5	6	7
The ease of searching for suppliers	1	2	3	4	5	6	7

Ease of authorisation is a *Processing* item in the U.K., but a *Usability* item in the replication study. By clarifying the detail of the item one may ensure that it loads more consistently in future work.

	Well below my expectations						**Well above my expectations**
The authorisation process	1	2	3	4	5	6	7
The speed of approving orders	1	2	3	4	5	6	7

The two items which did not load sufficiently on a single factor may also require re-wording/splitting. The *system security* item currently reads 'the e-procurement system is secure'. This variable may need splitting to reflect financial, non-financial, and order processing aspects of security.

	Well below my expectations						**Well above my expectations**
The ability to protect against data theft	1	2	3	4	5	6	7
The ability to protect against data loss	1	2	3	4	5	6	7
The efficiency of security features	1	2	3	4	5	6	7

The *order accuracy* item currently reads *'the e-procurement system ensures orders are delivered accurately'*. This might be re-worded to reflect both supplier and system influences.

	Well below my expectations						**Well above my expectations**
Sending error-free orders to supplier	1	2	3	4	5	6	7
The accuracy of orders delivered (right amount, right place, right time)	1	2	3	4	5	6	7

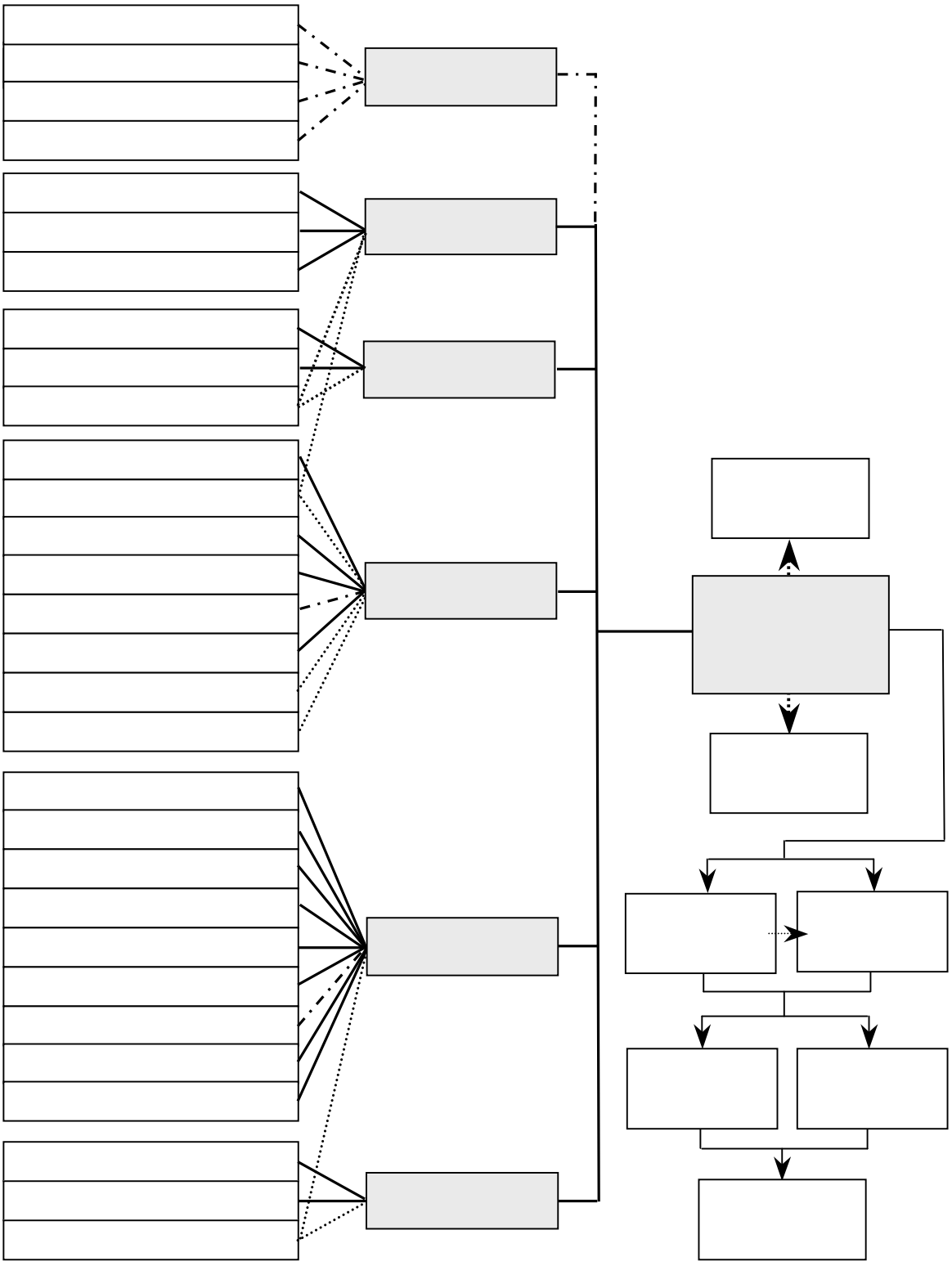
7.5 Conclusion on *EPQ Scale* Replication

The *EPQ Scale* derived in the original study is broadly applicable to the replication study. Of the 24 items used in the Dutch factor analysis, 79% load as hypothesised in the *EPQ Scale*. Where 3 items have shifted between factors, there are obvious and logical explanations. In addition, the possibility of multiple interpretations for the two items that failed to load sufficiently on any factor has been discussed.

Analysis supports the existence of five universal dimensions of *Perceived EPQ* – *Training, Professionalism, Processing, Content,* and *Usability*. However, *Specification* does not appear to be applicable to all e-procurement users. This issue remains important for e-procurement providers. However, some aspects of system functionality may only be of concern to a sub-set of users who, in addition to ordering, use e-procurement systems for budgeting, payment and reporting. It may also reflect the different levels of concern with budgets and on-time payment that exist across organisations. In addition, items concerned with processing complex orders and confidentiality may to be limited in their universal applicability. However, it is argued that these items could simply require re-wording and clarification.

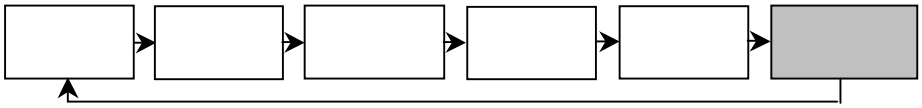
The different significance coefficients in the two studies, suggests that *Perceived EPQ* may be dominated by different factors in different settings. It also implies that some factors govern perceptions at different points of implementation. For example, *Training* perceptions may become less important over time, whilst *Specification* items increase in relevance as users seek to adopt more advanced e-procurement tools such as reporting, e-invoicing, or e-payment. The replication study is valuable in assessing the proposed *EPQ Scale* and suggesting areas for improvement. **Figure 38** shows the *EPQ Model* in light of the original research findings and the first replication study. As such, it represents the most recent 'work-in-progress' in modelling *Perceived EPQ.* Having presented findings of initial replication work, the next chapter presents conclusions on the study as a whole.

Figure 38. ***EPQ Model*** **(Post-** ***Replication 1*****)**



Consistent item or *EPQ* factor
Applicable item, but unstable loading
Context-specific item or *EPQ* factor

Chapter 8: Conclusions & Contributions



This thesis has presented the findings of a study exploring e-procurement quality from an internal customer perspective (*Perceived EPQ*). The final chapter draws conclusions on the study. It begins by presenting answers to the research questions, followed by an examination of the quality of findings and research limitations. The contribution of the work and areas for further research are then reviewed. The thesis concludes with some final thoughts.

8.1 Defining Perceived EPQ

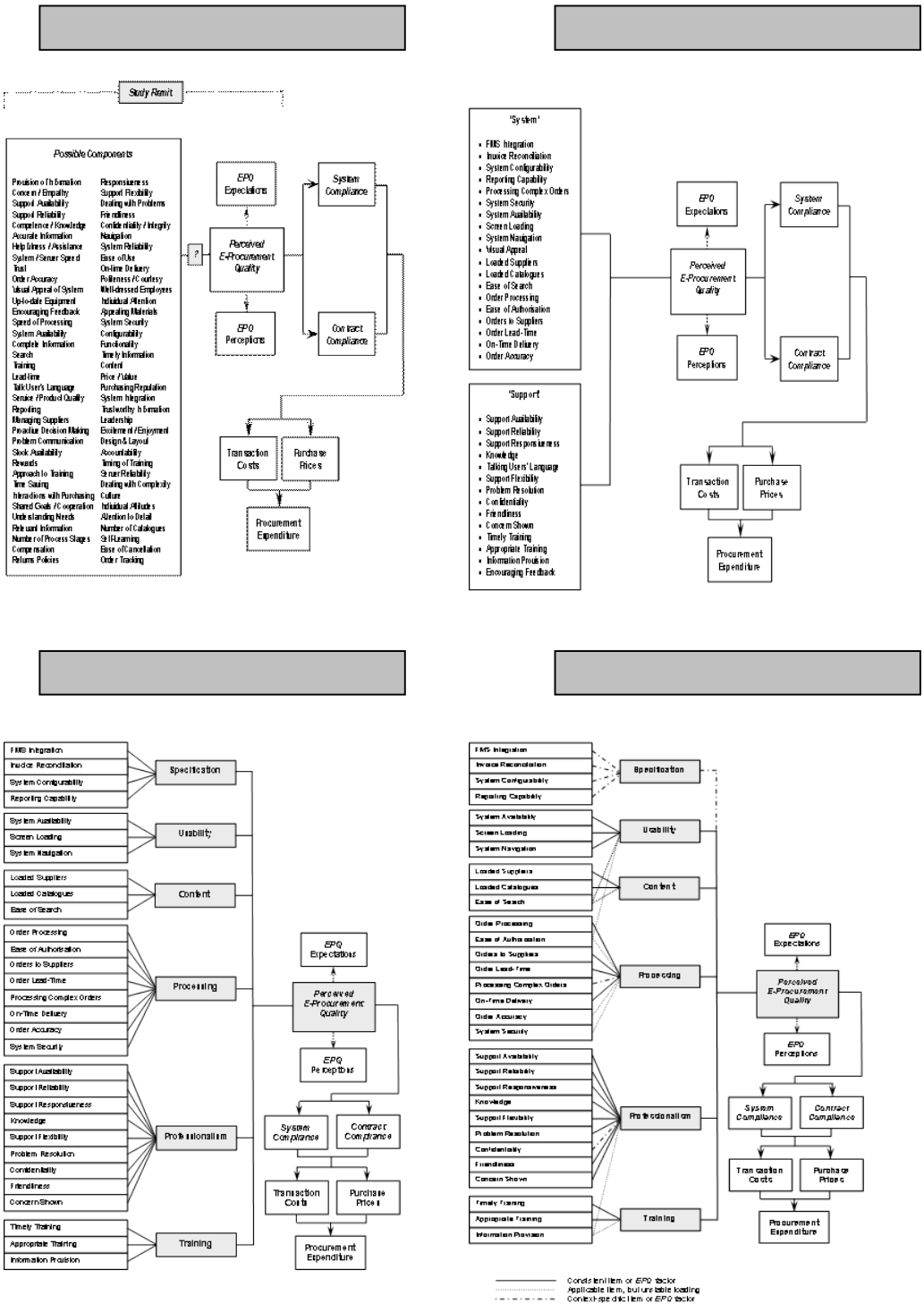
Successful implementation of e-procurement relies on individuals using a system and its contracts appropriately. Despite the fact that *Perceived EPQ* appears to be an important driver of both system and contract compliance, little research has focused on the subject. The overall aim of the study has been to model *Perceived EPQ* and to develop a tool for its measurement. In doing so, it has been necessary to identify the components and structure of *Perceived EPQ,* and to examine ways to operationalise construct measurement. Objectives resulted in the following questions being posed:

RQ1: What are the components of Perceived EPQ?
RQ2: What is the structure of Perceived EPQ?
RQ3: How can Perceived EPQ measurement be operationalised?

Service Quality literature provides the conceptual underpinning for the construct at a theoretical level. *Perceived EPQ* is defined as the gap between internal customer expectations and perceptions of e-procurement delivery. This definition draws on disconfirmation theory, found in much of the *Service Quality* literature. In addition, empirical study suggests that this is an appropriate conceptualisation. At an operational level, *Perceived EPQ* is partly informed by *E-Procurement, Internal Service Quality, Information Systems Quality* and *E-Service Quality* literature, but

most importantly by empirical data. The study has applied a case approach, using mixed methods to develop and validate the *EPQ Scale.* **Figure 39** shows the process by which understanding of *Perceived EPQ* has developed through the study. It demonstrates the progression from relatively abstract notions, to a much clearer sense of the construct, its components, structure, and relationship to other constructs.

Figure 39.Progression of *EPQ Models*

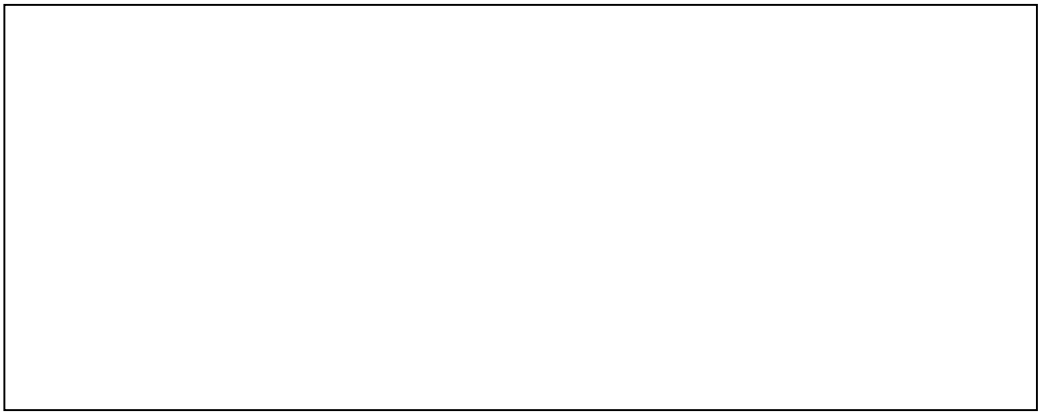


Perceived EPQ is comprised of 30 components:

These components are: EMS integration, invoice reconciliation, system configurability, reporting capability, system availability, screen loading, system navigation, loaded suppliers, loaded catalogues, ease of search, order processing, ease of authorisation, orders to suppliers, order lead time, processing complex orders, on-time delivery, order accuracy, system security, support availability, support reliability, support responsiveness, knowledge, support flexibility, problem resolution, confidentiality, friendliness, concern shown, timely training, appropriate training, and information provision.

8.1.1 What are the components of *Perceived EPQ*?

The process of identifying *Perceived EPQ* components started by examining relevant literature – *E-Procurement, Service Quality, Internal Service Quality, Information Systems Quality* and *E-Service Quality*. This review resulted in a list of 72 potential variables (Table 9, Chapter 3). Interviews have been used to develop an understanding of *Perceived EPQ*, as seen by internal customers. As noted, in section 4.5.2, this ensures that construct variables are not pre-defined by the researcher, but empirically grounded within the respondents' frame of reference. In addition to the literature 'start list', open codes have been derived from interview notes and post-interview contact summary sheets. The grounded approach avoids force-fitting the data into pre-existing codes (Miles & Huberman, 1994). Axial coding has been used to group codes with similar characteristics into broader categories whilst retaining their original meaning (Glaser & Strauss, 1967). Further interviews have been carried out to refine codes and to suggest a set of selective codes for use in a measure of *Perceived EPQ* – the *EPQ Scale*. Further empirical analysis, based on questionnaire data in *Phase 3*, has led to minor refinements to this scale. Analysis suggests that research question one may be answered as follows:



The replication study posits an *EPQ Scale* with 22 variables and a 'robust' scale, comprising 19 consistent items across the two settings. At this stage, neither the 22- nor the 19-item scales are seen as the best measure of *Perceived EPQ*. The initial replication has helped to highlight areas of inconsistency and has given focus to improvement efforts. Further studies, using an improved set of *EPQ* variables, should ensure that 'good items' are not discarded on the basis of a single replication. Only

***Perceived EPQ* is comprised of 6 factors:**

Specification, Usability, Content, Processing, Professionalism,* and *Training

Specification refers to the system functionality and includes *FMS integration, invoice reconciliation, system configurability,* and *reporting capability.*

Usability is concerned with the ease of using an e-procurement system and includes *system availability, screen loading,* and *navigation.*

Content refers to what is loaded onto the system and how easy it is to find. It includes *loaded suppliers, loaded catalogues,* and *ease of search*.

Processing focuses on order cycle-time. It includes *order processing speed, ease of authorisation, order tracking, order lead time, processing complex orders, on time delivery, order accuracy,* and *system security.*

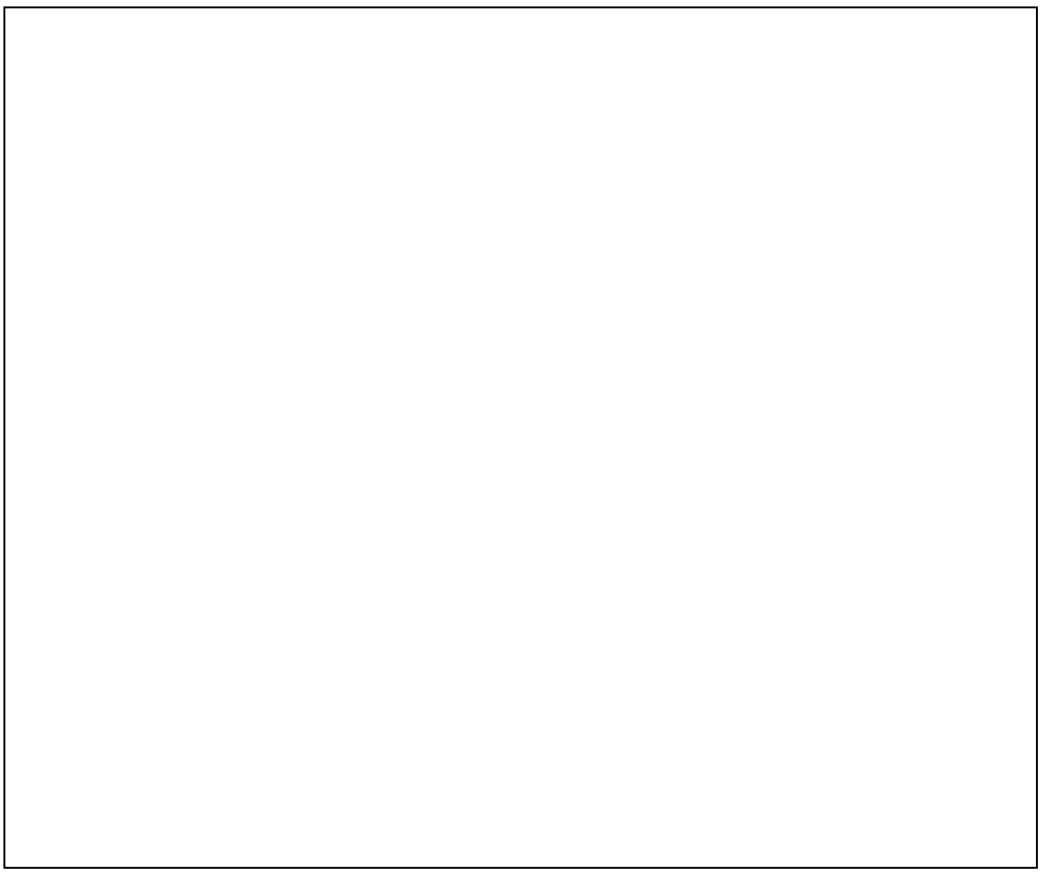
Professionalism is concerned with the ongoing support provided to internal customers of e-procurement. It includes *support availability, support reliability, responsiveness, knowledge, support flexibility, problem resolution, confidentiality, friendliness,* and *problem shown.*

Training deals with how effectively information regarding e-procurement system use is delivered to internal customers. It includes *timely training, appropriate training,* and *information provision.*

when there is sufficient data from other replications can universal and context-specific components be confidently identified.

8.1.2 What is the structure of *Perceived EPQ?*

Questionnaire data from *Phase 3* and the *Replication Study* have been used to examine the latent structures of *Perceived EPQ*. As noted in section 6.1, factor analysis allows large numbers of correlated variables to be condensed into a small subset of factors, whilst retaining the character and explanatory power of the original variables. This simplifies multivariate analysis and provides a small set of concepts to consider in decision-making (Hair *et al*, 1998). From the proposed *EPQ Scale*, just three variables have been deleted during scale purification. This study suggests that research question two may be answered as follows:



As detailed in section 6.2, validation suggests the *EPQ Scale* is both a reliable and valid measure of *Perceived EPQ*. Furthermore, the structure exhibits a high degree of convergence and discrimination. The replication in Holland has focused on assessing

the applicability of the *EPQ Scale* to a different e-procurement context. As noted in section 7.5, the scale is broadly applicable with 79% of items used loading as hypothesised. Where 3 items have shifted between factors, there are obvious and logical explanations. In addition, the possibility of multiple interpretations for the two items that failed to load sufficiently on any factor has been discussed. Analysis supports the existence of five universal dimensions of *Perceived EPQ – Training, Professionalism, Processing, Content,* and *Usability*. However, *Specification* does not appear to be applicable to all e-procurement users. Some aspects of system functionality may only be of concern to a sub-set of users who, in addition to ordering, use e-procurement systems for budgeting, payment and reporting. Analysis also indicates that different factors may dominate *Perceived EPQ* in different settings or at different stages of implementation.

8.1.3 How can *Perceived EPQ* measurement be operationalised?

Finally, *Phase 3* data has been used to assess alternative ways to calculate *Perceived EPQ*. The first is based on the paired-statements used in the study, whilst the second is based on a single-statement approach. Section 6.3 presents data analysis comparing the two methods of calculation. The various tests carried out indicate that both approaches produce scales that are reliable and valid. However, it is clear that in many areas the single-statement *EPQ Scale* does outperform the paired-statement scale. Whilst the improvements in reliability and validity statistics are generally marginal, one must also consider the increased length of the paired-statements when assessing the two options.

As discussed in section 6.3.4, in cases where expectations are considered relatively stable, it may be preferable to collect data regarding the perceptions-expectations gap in single statements (Carman, 1990; Babakus & Boller, 1992; Reynoso & Moores, 1995). This could reduce the likelihood of boredom setting in during questionnaire completion and therefore improve confidence in subsequent data analysis (Babakus and Boller, 1992). It has also been argued that when academics or practitioners do select a single-statement approach, it may be more appropriate for statements to explicitly incorporate the perceptions-expectations gap, rather than simply applying

Perceived EPQ measurement may be operationalised in three ways:

- **Paired-statement – gap between expectations and perceptions**
- **Single-statement – perceptions only**
- **Single-statement – gap between expectations and perceptions**

the perceptions element of the paired-statement approach. Analysis suggests that research question three may be answered as follows:

Option 1: This option may be most appropriate when:

- Expectations are not known
- Expectations change significantly over time
- Some expectations items may not be vector attributes
- Focus is on the gap between expectations and perceptions
- Questionnaire length is less critical

Option 2: This option may be most appropriate when:

- Expectations are clearly established and stable
- All expectations items appear to be vector attributes
- Prediction of compliance is critical
- Minimal questionnaire length is important
- Potential upward bias of ratings is not critical

Option 3: This option may be most appropriate when:

- Theoretical underpinning of *Perceived EPQ* is considered important
- Focus is on the gap between expectations and perceptions
- Predication of compliance is important
- Minimal questionnaire length is important
- Potential over-inflation of service ratings is considered critical

Rather than stating that one method of construct measurement is superior, the contingency approach helps researchers and practitioners to operationalise *Perceived EPQ* measurement based on their own objectives. This creates increased flexibility for the measurement tool.

8.2 Quality of Findings & Research Limitations

Research answers only have real value if one can demonstrate that the methods by which questions were examined are valid (Yin, 1994). The quality of findings is considered in relation to reliability, construct validity, internal validity, and external validity. This is followed by a review of research limitations.

8.2.1 Quality of Findings

As noted in section 4.7, the quality of research can be assessed in terms of reliability, construct validity, internal validity, and external validity (Yin, 1994; Miles & Huberman, 1994). Reliability refers to the ability to replicate findings. As noted in section 4.7.1, two tactics have been used to ensure reliability of findings – *case study protocol* and *case study database.* The collection of data, documentation and case write up have been filed and made available to other researchers. This allows others to follow the process of data collection and analysis in order to arrive at similar results.

Construct validity is concerned with establishing appropriate operational measures for the construct being studied (Yin, 1994). As discussed in section 4.7.2, Construct validity, is ensured through the chain of evidence, data triangulation, and review by informants. Code sheets, post-interview contact sheets, and cluster boards all form summaries of data and a link in the chain of evidence between raw data and analysis. Triangulation of data is critical in developing a robust measure of *Perceived EPQ*. The use of both qualitative and quantitative methods has helped ensure that the construct is appropriately conceptualized (Jick, 1979; Bryman, 2001). Finally, findings have reviewed extensively by those involved in the study.

Internal validity refers to the identification of causality between dependent and independent variables (Emory & Cooper, 1991). Given the fact that the study is exploratory, internal validity is based on convergence of evidence (Yin, 1994). In this study, predicted patterns based on qualitative work have been compared with patterns from quantitative work. The high level of congruence between the patterns, shown in **table 71**, provides evidence of internal validity.

Table 71. Internal Validity of *EPQ Scale*

Internal Validity	***Phase 2***	***Phase 3***
Variables in *EPQ Scale*	33	30
Correlation: *EPQ Score* to *OEPQ*	.870(**)	.698 (**)
Regression: *EPQ Score* to *OEPQ*	R^2 .750	R^2 .486
Regression: Stepwise Factors to *OEPQ*	N/A	R^2 .549
Regression: Six Factors to *OEPQ*	N/A	R^2 .551
Regression: All *EPQ* variables to *OEPQ*	R^2 .913	R^2 .587

External validity is the extent to which findings can be generalised beyond the original case studies. The case approach relies on theoretical sampling (Glasser & Strauss, 1967) and analytical generalisation. However, the work benefits from an element of statistical generalisation, as a result of questionnaire data collected in the original research and the replication study. Whilst there are some differences between the two studies, no new components of *Perceived EPQ* have been identified and the *EPQ Scale* has been found to be a robust measure of the construct.

In conclusion, the research protocol and case study database provide the raw data on which the *Perceived EPQ* construct is based ensures reliability. The use of code sheets, post-interview contact sheets, and cluster boards provide the link in the chain of evidence between raw data and analysis. Construct, internal and external validity have been demonstrated through the use of triangulation, pattern matching, and replication work.

8.2.2 Research Limitations

There are a number of methodological issues worth exploring in more detail. At a broad level, multi-methods stand accused of mixing incommensurable paradigms and epistemological commitments (Burrell & Morgan, 1979). However, frameworks for classifying research designs, based on the relationship between the kind of information and the approach to knowledge generation, often ignore the fact that a single method or technique may be used in various ways and by researchers with very different philosophical positions (Donaldson, 1998). Research methods are much freer in terms of ontology and epistemology than is often suggested (Byman, 2001; Mingers, 2001).

The scope of the research may also be limited by variables and dimensions used to define *Perceived EPQ*. The aim of selection has been to balance comprehensiveness (i.e. capturing the totality of the construct) and parsimony. Whilst it is clear that other factors also influence *Perceived EPQ*, the researcher believes that the balance struck is an appropriate one. Another concern with the proposed *EPQ Scale* is that it does

not take a process view of service (cf. Johnston, 2005). It is possible for someone to be very unhappy with the first stage of the procurement process, which may influence perceptions of *EPQ* at subsequent stages.

There are a number of authors who question the whole notion of an internal customer (Harari, 1991, 1993; Guasapari, 1995; Mudie, 2003). These writers consider that focusing on internal customers detracts attention from the 'real' customers of an organisation and sets up a series of dominance-subservience relationships. In addition, the internal customer model may focus too heavily on improving internal working relationships, and not enough on whether the relationship is actually necessary. Harari (1991) argues that we should forget about serving internal customers and instead treat them as equal partners. Guasapari (1995) suggests that the terms 'client' and 'provider' should be used instead of internal customer and supplier. He argues that the term 'client' is suggestive of the nature of the relationship, whilst 'provider' is suggestive of the direction in which work must flow. Hart (1995) agrees with this view, but does accept that part of the problem relates to terminology rather then the ideas behind the internal customer concept.

In addition to these relatively broad concerns, there are three more specific issues worth consideration. The first relates to what has been included in the study. Throughout the research process, the author has had to make difficult decisions on what to exclude from the study. In particular, it was originally hoped to explore moderating factors which influence *Perceived EPQ* and to develop a more robust measure of e-procurement compliance. However, given the time needed to empirically delineate the *Perceived EPQ* construct and then to validate the proposed *EPQ Scale*, these areas have only been partially examined in the study. As noted in the literature review, within the *Information Systems* literature there is a large body of empirical evidence supporting the relationship between perceptions of information systems and adoption practices. For this reason, the relationship between *Perceived EPQ* and e-procurement compliance has not been examined in great detail. However, there may be value in undertaking e-procurement-specific studies which empirically validate the *Information Systems* consensus that positive perceptions of systems lead to higher levels of adoption.

The second specific issue relates to the context in which *Perceived EPQ* has been studied. All of the cases used in the research are public sector organisations. This raises the question as to whether the research findings might have been different had data been collected in private sector organisations. It is not yet possible to state that the way in which *Perceived EPQ* is defined in the private sector is the same as identified in this study. Clearly, further research is merited to assess the extent to which *Perceived EPQ* items and factors are, or are not, determined by the sector of an organisation.

Finally, this study has focused on e-procurement at a tactical level. As such, one can only draw conclusions on how *Perceived EPQ* is defined by users of tactical e-procurement systems. Individuals involved in procurement at a strategic level may well define *Perceived EPQ* differently to those examined in this research. Organisations have typically used tactical systems as a 'point of departure' when implementing e-procurement. Therefore, given the exploratory nature of the research, it was considered appropriate to focus the work on this area of *Perceived EPQ*. However, it is clear that future research exploring perceptions of other forms of e-procurement would be extremely useful.

8.3 Outlining a Contribution to the Subject

It is argued that research should have value to both the academic and practitioner community. From an academic standpoint, it is important to develop an understanding of *Perceived EPQ* that will encourage others to explore this under-researched area. From a practitioner perspective, there seems little point in the study if findings cannot be used to improve the way e-procurement is implemented and delivered in organisations.

8.3.1 Value to Academics

Within the literature, research exploring drivers of e-procurement adoption remains limited (Zsidisin & Ellram, 2001). Currently, much of the work on e-procurement focuses at a strategic level, considering financial outcomes (Lancioni *et al.* 2000;

Zsidisin & Ellram, 2001). Whilst this literature clearly has value, it is equally important to examine the drivers of procurement expenditure. As discussed in the literature, compliance appears critical in reducing transaction costs and purchase price, which in turn is strongly influenced by *Perceived EPQ.* Despite this, there is very little work exploring e-procurement quality from an internal customer perspective. Most research that exists lacks substantiation, making it hard to judge the validity of the assertions that are made.

This study is the first to empirically examine *Perceived E-Procurement Quality* and to develop a tool for its measurement. The *EPQ Model* illustrates how perceptions of e-procurement quality can significantly influence both system and contract compliance, which in turn impacts on transaction cost and purchase price. Clearly, it has not been possible to empirically validate each link in the *EPQ Model* in this study. However, the model provides a framework for testing proposed links through further research. In measuring *Perceived EPQ,* the *EPQ Scale* exhibits high levels of reliability and validity, and its content and structure is broadly supported through the replication study. The scale appears to be applicable across a number of different e-procurement settings. However, it is important to note that whilst five of the *EPQ* dimensions are considered universal, *Specification* may only be considered by a sub-set of e-procurement users in some cases. For the academic community, this provides a valuable insight into what is fast becoming an important area for investigation. The *EPQ Scale* has value by enabling other academics to apply it in different e-procurement contexts, so as to extend the literature instead of 're-inventing the wheel'. Rather than duplicating effort, researchers can use the tool in relation to their own area of interest within the e-procurement field.

Considering the implications for the broader service quality literatures, it has been argued that the differences between traditional service settings and e-procurement make the application of *SERVQUAL* inappropriate when measuring *Perceived EPQ.* This raises the question of breadth versus depth in scale development. Many academics seem keen to create wide-ranging construct measures, but in doing so often produce scales that are limited in terms of reliability and validity. It is argued that the academic community might benefit from focused measurement tools. It appears that modest ambitions may help create more reliable and valid construct measures.

In line with much of the *Service Quality* literature, the study supports the use of disconfirmation theory in modelling *Perceived EPQ*. Data analysis supports the view that whilst disconfirmation may provide an appropriate theoretical underpinning for service quality, there remain questions over the most appropriate way to operationalise this cognitive process. Rather than suggesting that there is a 'right' answer to the question of service quality measurement, it is argued that individuals should be guided by their research objectives. In this way, one is accepting that all three measurement approach discussed (Section 8.1.3) have strengths and weaknesses.

8.3.2 Value to Practitioners

For practitioners, the *EPQ Model* illustrates the importance of *Perceived EPQ* in ultimately delivering savings from e-procurement implementation. The *EPQ Scale* is a useful diagnostic tool which can highlight areas of weakness in e-procurement delivery. During e-procurement implementation and ongoing delivery, service providers need to understand the views of their internal customers. By measuring various facets of *Perceived EPQ*, managers are able to pinpoint where the biggest problems exist and make efforts to rectify them. It is important to note that the scale is a diagnostic tool, rather than a solution in its own right. Whilst the use of a *Perceived EPQ* questionnaire will highlight areas of concern, further discussion with users is critical in understanding the specific nature of problems. When considering the most appropriate way to calculate *Perceive EPQ*, the contingency approach posited in the study should be useful to managers. Enabling the selection of measurement approach based on a set of contingencies creates a high level of flexibility for managers.

Beyond the original study, the *EPQ Scale* has already been used in *Basildon District Council* as a way of focusing e-procurement improvement efforts. In this case, a list of the 'worst ten' variables was produced from questionnaire data as a basis for discussions with internal customers. The result of this forum has been to make changes to the provision of training and information, as well as suggesting how catalogues could be improved. In addition, a second round of survey work is now underway in *Essex County Council* with the aim of assessing the extent to which

Perceived EPQ has improved since feedback of the first survey results in January 2005. These examples provide a good illustration of how beneficial the *EPQ Scale* may be in improving e-procurement delivery across organisational settings.

8.4 Future Research

This section explores the opportunities for further research. Areas considered include replication of the *EPQ Scale*, development of e-procurement compliance measures, comparing 'broad' measurement scales with the *EPQ Scale*, and exploring other factors that influence adoption and use of e-procurement.

8.4.1 Replicating the *EPQ Scale*

Whilst analysis points to the existence of six dimensions of *Perceived EPQ*, further work is needed to assess how universal these are across national boundaries, business sectors, or user types. Having examined the *EPQ Scale* in four U.K. cases and one Dutch case, further research is currently underway in the U.K. and Norway. In the U.K, the researcher is working with *Essex County Council* to carry out an annual review of *Perceived EPQ* with a user-base now increased from 156 to almost 2000. The aim of this work is to enable continuous improvement in e-procurement delivery and set the improvement agenda for the coming year. In Norway, an academic colleague at the *Norwegian University of Science and Technology* is carrying out a replication study of university e-procurement users to assess the extent to which *Perceived EPQ* may differ for nationalities apart from British and Dutch.

Considering the difference between public and private sectors, research is planned in a Dutch logistics firm and a U.S. financial services company. This will involve exploratory research to identify any *EPQ* variables in the private sector which are not currently incorporated in the *EPQ Scale.* This exploratory work will be carried out using semi-structured interviews or focus groups. Subsequent work will involve survey work and validation of an *EPQ Scale* which is incorporates any sector-specific variables.

Finally, it is argued that further work using the *EPQ Scale* with more strategic e-procurement users would be valuable. This could help to identify *EPQ* variables which appear to be generic and others that are more specific to sub-sets of e-procurement users. Academics involved in e-sourcing, e-tendering, and e-reverse auction research may find the scale a useful skeleton from which to build more system-specific / user-specific measures of *Perceived EPQ.*

In all of these studies, structural equation modelling can be applied as a way of testing how variables interrelate in the *EPQ Model.* This technique allows for the testing of alternative factor structures based on differences in nationality, business sector (public versus private), and user type (tactical versus strategic). The various replication studies have the underlying aim of assessing and refining the *EPQ Scale* to provide a robust measure of *Perceived EPQ.* As noted in section 8.1.1, the 'jury is still out' on the best set of items for measuring the construct. The studies should help to clarify items that are universal and other that may be context specific.

8.4.2 Developing *Compliance* Constructs and Exploring Relationships

As noted in section 2.1.5 and 2.1.6, the e-procurement literature posits the view that e-procurement compliance is significantly influenced by perceptions of e-procurement quality (cf. Marshall *et al.* 1998; de Boer *et al.* 2002; Croom & Johnston, 2003; Harink, 2003). In addition, the positive correlation between perceptions of systems and adoption is empirically supported in the *Information Systems* literature. As shown in figure 14 (Page 98), the aim of the study has been to model *Perceived EPQ*, rather than examine its relationship with elements of compliance in the broader *EPQ Model.* However, it is clearly important for the future development of the scale to demonstrate that *Perceived EPQ* does indeed matter! There is little point in managers attempting to improve the quality of e-procurement delivery if it will have an insignificant effect on system and contract compliance.

As noted in sections 4.5.5 and 4.6.1, statistical data regarding e-procurement compliance was collected in *Phase 2* and *3* of the study. Appendices 11 and 12 provide details of statistical testing aimed at examining the correlation between

Perceived EPQ and elements of e-procurement compliance. Whilst these measures are self-reported, they are at least useful in initially examining the relationships between constructs. **Table 72** summarises the data found in the two appendices. In line with the literature, data from the study points to a positive relationship between *Perceived EPQ* and elements of e-procurement compliance. *Phase 3* suggests that the construct is particularly important in driving contract compliance, whilst *Phase 2* data found a stronger relationship with system compliance.

Table 72. Relationship between *Perceived EPQ* and E-Procurement Compliance

Perceived EPQ and System Compliance	*Phase 2*	*Phase 3*
Correlation: *EPQ Score* to *System Compliance*	.722 (**)	.525 (**)
Regression: *EPQ Score* to *System Compliance*	R^2 .507	R^2 .272
Regression: Stepwise Factors to *System Compliance*	N/A	R^2 .304
Regression: Six Factors to *System Compliance*	N/A	R^2 .301
Regression: All *EPQ* variables to *System Compliance*	R^2 .664	R^2 .339
Perceived EPQ and Contract Compliance	*Phase 2*	*Phase 3*
Correlation: *EPQ Score* to *Contract Compliance*	.407 (*)	.656 (**)
Regression: *EPQ Score* to *Contract Compliance*	R^2.140	R^2 .427
Regression: Stepwise Factors to *Contract Compliance*	N/A	R^2 .448
Regression: Six Factors to *Contract Compliance*	N/A	R^2 .449
Regression: All *EPQ* variables to *Contract Compliance*	R^2 .211	R^2 .508

It has been argued that to improve perceptions of *EPQ*, and thus the level of compliance, managers should focus improvement efforts on variables with the largest perception-expectation gaps. In each setting, these variables will differ depending on the level of e-procurement delivery and the requirements of e-procurement users. However, there may also be value in exploring whether any of the *EPQ Factors* are typically more significant than others in influencing levels of system and contract compliance.

As noted at the end of appendices 11 and 12, linear regressions for each *EPQ* factor were run against both *System Compliance* and *Contract Compliance* variables. These regressions indicate that all factors are significant predictors of compliance, but their power varies. For example, the most powerful predictor of *System Compliance* is

Professionalism (R^2 .259). This is followed by *Specification* (R^2 .148), *Processing* (R^2 .148), *Content* (R^2 .135), and *Specification* (R^2 .129). The least powerful predictor in this case is *Training* (R^2 .100). For *Contract Compliance*, *Processing* is the most powerful predictor (R^2 .318). This is followed by *Content* (R^2 .305), *Specification* (R^2 .250), *Professionalism* (R^2 .210), and *Usability* (R^2 .196). *Training* is the least powerful predictor of *Contract Compliance* (R^2 .140).

Whilst it is interesting to see the differences in the relative power of *EPQ* factors in predicting elements of e-procurement compliance, these regression results should be treated with caution. It is not possible at this stage to state that *Professionalism* is typically the most important factor influencing *System Compliance*, *Processing* is most critical in *Contract Compliance*, or that *Training* is the least important predictor in both cases. The results may be caused by the a range of factors, including research setting, extent of implementation, demographics of e-procurement users – to name but a few. Further research is clearly needed before making judgements as to the relative importance of *EPQ* factors in driving e-procurement use. A first step is to develop more robust measures of both system and contract compliance. The ongoing work in *Essex County Council* involves the development of a much more detailed compliance measure. This new measure will incorporate both self-reported use and 'hard' data from the financial management system. Once the development of this measure is completed, it will be incorporated in the Norwegian study. Compliance data from the two settings should provide a much clearer picture of the relationship between *Perceived EPQ,* its factors, and elements of compliance.

8.4.3 Comparing the *EPQ Scale* with 'Broad' Scales

It has been argued that there is a delicate balance between breadth and depth in scale development. As shown in the literature review, many measures of service quality focus on generalisation across a variety of contexts, but have been found lacking in subsequent research. It is clear that for a more focused scale to be considered valuable, it should demonstrate clear psychometric advantages over generic scales in its focal context. Therefore, a study comparing the *EPQ Scale* with broader scales (e.g. *SERVQUAL, EUCS, UIS, ISS*) would be worthwhile in exploring the relative

merits of 'narrow' and 'broad' construct measures. Based on discussion with colleagues, there appears to be two alternative methods for assessing the relative merits of alternative scales. One is to survey e-procurement users, with one random sample receiving the *EPQ* questionnaire and the other receiving a *SERVQUAL* questionnaire for example. Analysis could then be carried out to assess the psychometric merits of alternative scales. The other option is to get a smaller set of users to fill in both forms and the rate the ease of completion and relevance on a separate form or during a focus group. As yet, this research is at a planning stage.

8.4.4 Expanding the *EPQ Model*

Whilst data from the study supports the view in the literature that *Perceived EPQ* influences e-procurement compliance, it is clear that other factors also play a role in user adoption. In exploring adoption of e-procurement systems, Arbin (2006) presents the Electronic Procurement Adoption and Usage Model. Unlike this study, she does not seek to identify specific e-procurement variables. Rather, her work focuses largely on what might be termed 'moderating variables'. Issues relating to *organisational environment*, *experiences with previous or other systems*, *knowledge and experience*, *project management*, *communication*, *management support*, *relationships with suppliers*, and the *status of the purchasing department* are of particular interest in expanding the *EPQ Model* in the future. In a similar vein, the work of Reunis, van Raaij, and Santema (2004, 2006) provides interesting material for further development of the *EPQ Model.* Their research explores tactics for influencing e-procurement adoption. These are *persuasive, recommendation, management request, information push, appraisal & control, collaboration, legitimate pressure,* and *reward.* The authors argue that different tactics may be appropriate at different points in the implementation process, and that full compliance requires a combination of tactics over time. During the ongoing research with *Essex County Council,* the roles of moderating variables and influencing tactics are being examined. In addition, the researcher is developing a paper with a colleague at *Delft University of Technology* in Holland which seeks to expand the *EPQ Model* to include influencing tactics in e-procurement adoption.

Final Thoughts

Perceived EPQ is an important driver of compliance and is therefore critical in realising the potential financial benefits of e-procurement. Despite this, there is very little work examining the construct. This study is the first to empirically examine *Perceived EPQ*, and to develop a tool for its measurement. The value of the research is partly demonstrated by the use of findings in a number of academic and practitioner studies. From an academic perspective, the study models *Perceived EPQ* and illustrates how the construct relates to elements of compliance and ultimately procurement expenditure. The *EPQ Scale* provides a set of variables that are likely to be relevant when undertaking research within an e-procurement context. For practitioners, the *EPQ Scale* is a useful diagnostic tool which can highlight areas where gaps between expectations and perceptions exist. In addition, the study posits a set of criteria which enable managers to select the most suitable measurement method for *Perceived EPQ.*

The case study approach has proved to be a highly effective way of exploring *Perceived EPQ.* It has helped to ensure that the *EPQ Scale* is well grounded within an e-procurement context, whilst taking into consideration antecedent literature. Cleary, there will always be trade-offs between breadth and depth in research. Where one focuses on a small set of cases, it is important to appreciate the potential limitations in generalising results. However, it is the researcher's view that the balance struck here has been appropriate, especially given the use of mixed methods and the replication study.

This research is by no means the final word on *Perceived EPQ.* On the contrary, it is hoped the work presented will act as a catalyst for many more studies in the area. In particular, it is important to assess the universality of *EPQ* variables, to develop measures of compliance, to compare the *EPQ Scale* with established scales in the literature, and to explore other factors that influence e-procurement adoption. Whilst the thesis is presented as a distinct project, it is of course just a part of an open-ended process. Ideas presented here have continually changed during study and will no doubt continue to do so as further research is undertaken.

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Appendices

Appendix 1. *Phase 1* Interviewees

ID	Name	Role	Department
1.1	Lesley Jennings	Office Consumables Officer	Office Services
1.2	Steve Cooper	Procurement Officer	Procurement Services
1.3	Joanne Messenger	Planning Administration	Planning Service Group
1.4	Kelly Davies	Office Services Assistant	Asset Management
1.5	Cara Gale	Support Officer	Procurement Services
1.6	Stephanie Bickerdike	Training & Support	Procurement Services
1.7	Anna Hook	Information Manager	Highways & Transportation
1.8	Ben Gamblin	Receptionist	Trading Standards
1.9	Braba Linganandhan	Administrator	Energy Services
1.10	Eileen Coppick	Admin Support Officer	Highways & Transportation
1.11	Alex Moore	Programme Officer	Information Service
1.12	Elisabeth Bluck	Financial Officer	Financial Services
1.13	Andrew Conolly	Technical Clerk	Highways & Transportation
1.14	Elaine Management	Office Services Assistant	Asset Management
1.15	James Neill	Performance & Business Manager	Information Systems
1.16	Debbie Nevill	Committee Assistant	Law & Administration
1.17	Trish Wilcox	Office Supervisor	Social Care
1.18	Liz Tilbeury	Assistant	Social Care
1.19	Sue Sleyton	Administrative Support	Media & Marketing
1.20	Beverley Whitbread	Office Manager	Media & Marketing
1.21	Stephen Glover	Head of Laboratory	Trading Standards
1.22	Siobhan McGinn	Contracts Assistant	Information Systems
1.23	Tina Cavey	Accommodation Officer	Social Care

Appendix 2. *Phase 1* Interview Guide

- *Name, Date*
- *Introduction & Research Aims*
- *Confidentiality*
- *Recording*

……

- *Personal Information*
  - *Tell me a bit about yourself and what you do here.*
  - *What do you use Marketplace for?*

- *Marketplace: Best Aspects*
  - *What are the things you like about Marketplace and why?*

- *Marketplace: Worst Aspects*
  - *What are the things you dislike about Marketplace and why?*

- *Marketplace: Improvements*
  - *What things would you like to see change?*
  - *How would you improve Marketplace?*

- *EP Compliance*
  - *To what extent do you use Marketplace for purchasing?*
  - *What sort of ordering is not suited to Marketplace?*
  - *In what other ways do you purchase other than Marketplace?*
  - *To what extent do you use catalogues?*

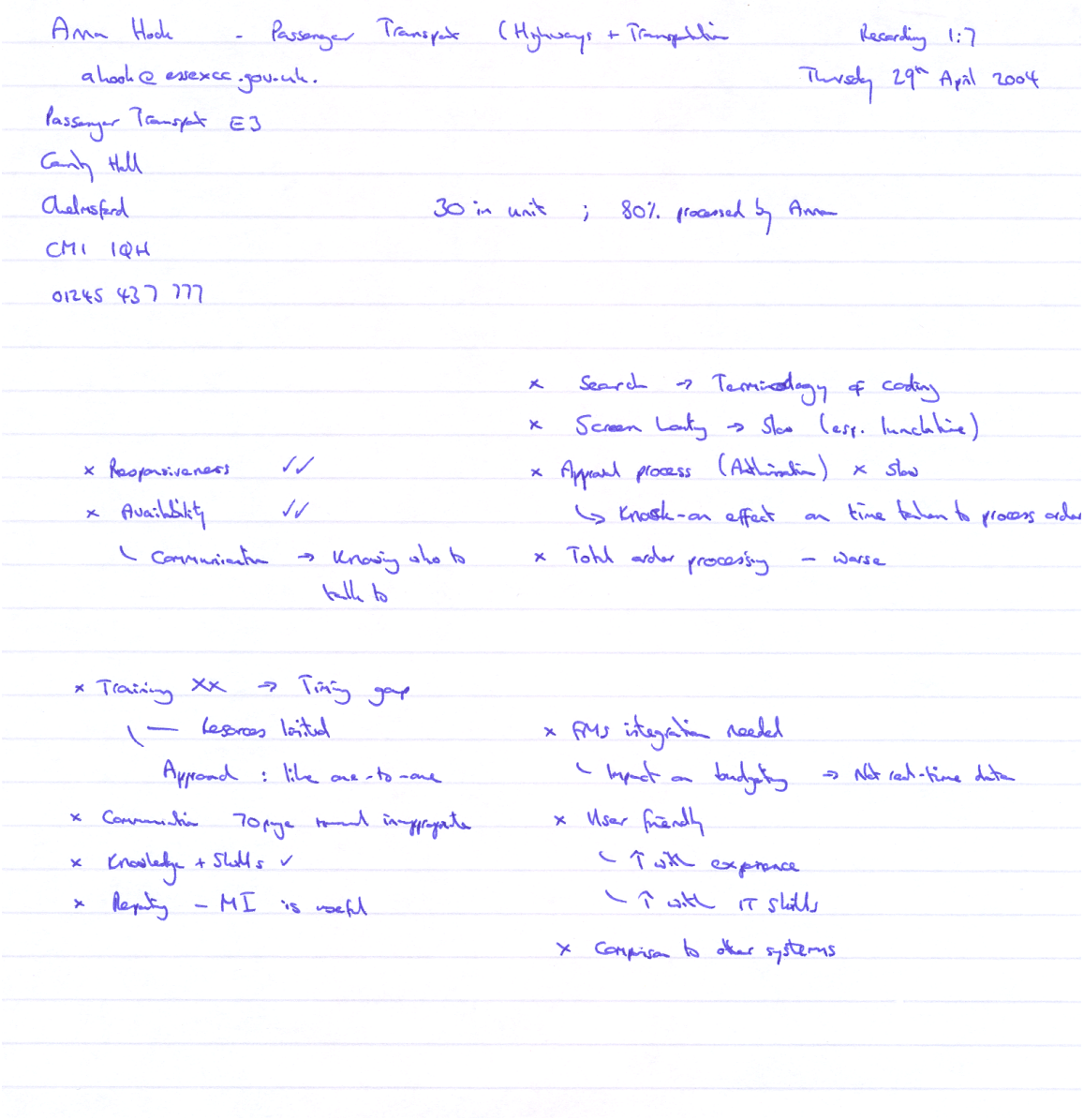
- *Other Issues*
  - *Are there any other things you would like to talk about or expand on?*
  - *Are there any issues you feel we haven't looked at?*

……

- *Thanks*
- *Further Comments Welcome*
- *Transcript Sending & Approval*

……

Appendix 3. Post-Interview Contact Summary Sheet



Anna Hook - Passenger Transport (Highways + Transportation) Recording 1:7

ahook@essexcc.gov.uk. Thursday 29th April 2004

Passenger Transport EJ

County Hall

Chelmsford 30 in unit ; 80% processed by Anna

CM1 1QH

01245 437 777

× Search → Terminology of coding

× Screen Laity → Slow (esp. handwriting)

× Responsiveness ✓✓

× Availability ✓✓

× Approval process (Authorisation) × slow

↳ knock-on effect on time taken to process order

↳ Communication → knowing who to talk to

× Total order processing – worse

× Training XX → Tiring guy

↳ — resources limited

Approach : like one-to-one

× FMS integration needed

↳ Impact on budgeting → Not real-time data

× Communication Topic round inappropriate

× User friendly

↳ ↑ with experience

× Knowledge + Skills ✓

↳ ↑ with IT skills

× Reports – MI is useful

× Comparison to other systems

Appendix 4. Example of Coded Transcript

Q: What would you say are the best and worst aspects of *Marketplace*?

A: The system itself – the initial thing was the inputting of the information. It is not too bad – I am quite IT literate, I am one of the IT champions for our area. I don't have a problem with computers. They system becomes more user friendly the more you use it but I don't find it that user friendly, I think that is with a lot of things. It doesn't hold a lot of the same aspects that you would expect from a Window's based package which is what most people use.

I don't think it's that user friendly. You have to remember if you want to go back you have to click on the steps at the top you can't just hit the back-key because you lose everything. So there are a lot of areas where it falls down.

When we had our training back in October fair enough it was all quite logical to do and I thought this is not going to take me a great deal of time. Whereas in reality the first time I attempted to do it after we went live I spent the whole of one afternoon about four hours trying to book an order and because every time you click the back key you lose everything it took all afternoon!

I know Steph sent out the user guides and everything else but it is about 70 pages long. And these people are not going to sit and read a user manual like that. We were quite lucky, I threw my toys out of the pram and Steph sat with us for about an hour and a half and when somebody goes that and that and that you think this is so easy. But that is what you need but unfortunately I don't think you have got the time to have a one to one with everybody as and when they go live.

Q: But for you that helped?

A: Yes, absolutely. Also, whenever we ask for a supplier it is categorised by people up here [in procurement]. We write down what they supply us which to a large extent. We don't want to spend the time categorising things because it is not our job, but you also run the risk, you can tell people what they supply but it goes up there and it gets categorised in something that you don't think it should be.

Q: You mentioned training earlier, tell me about that.

A: The initial training that we had I think there was only ten or fifteen people at a time which was good. And I think everybody in that room without exception came away more positive than when they went in and thought it is not half as difficult as I thought it was going to be and we will be alright. But the length of time - It was the way we were treated in-between that because a lot of finance did not understand what procurement were doing. I could not fault Steph. When we had a problem we phoned her up and she came straight down and it was that one to one training that you needed. I can phone up or I can E-mail her every time I have got something I don't really understand and she will either give me an answer then or she will come and see me. And I don't think you can beat that. But on the occasions that Steph is not at her desk you will phone up and the person will say I am sorry I don't actually deal with Market Place. So you are half way through an order you have got a manager crowing in your ear saying have you raised that yet. Some of these things they want stuff straightaway before they will even reserve you the space in the magazine or whatever. If you don't know what you are doing and there is nobody to help you are absolutely stuck!

Q: So what do you think should be done?

A: There needs to be more people available to give advice. If she is not there then nobody seems to be able to answer the question. It is not that they are being awkward they just don't know.

Q: Do you feel there is a lack of knowledge across a wider range of people in procurement?

A: Yes. Steph is the number we have been given and whether there are other people who know how they could have helped us the guys who do it day in and day out must know. It would be good if that group of people was widely known to everyone, then you'll be able to complete your order there and then.

Appendix 5. *Phase 2* Interviewees

ID	Org	Name	Role	Department
2.1	*TDC*	Natalie Hatcher	Purchasing Assistant	Procurement Services
2.2	*TDC*	Susan Saltmarsh	Office Services Supervisor	Environmental Services
2.3	*TDC*	Vicky Harrington	Administrative Assistant	Environmental Services
2.4	*TDC*	Judith Raison	Performance Coordinator	Computer Services
2.5	*TDC*	Adam Deveux	Building Surveyor	Housing Services
2.6	*TDC*	Peter Perry	Suport Officer	IT Section
2.7	*TDC*	Diedre Buckingham	Administrative Officer	Housing Services
2.8	*TDC*	Stacy Pickett	Management Board Support	Central Executive
2.9	*TDC*	Terresa Dawkins	Finance / Admin Officer	Community & Leisure
2.10	*TDC*	Janey Nice	Administrative Assitant	Legal Services
2.11	*TDC*	Toni Wright	Facilities Officer	Personnel & Management Services
2.12	*TDC*	Julie Green	Management Accountant	Financial Services
2.13	*TDC*	Claire Wright	System Support Officer	Benefits & Revenues
2.14	*MDC*	Natasha Brown	Personnel Assistant	Personnel
2.15	*MDC*	Christine Hitchins	Ordering Officer	Facilities
2.16	*MDC*	Phil Chappell	Procurement Officer	Corporate Services
2.17	*MDC*	Sofia Bishop	Administrative Officer	Environmental Health
2.18	*MDC*	Alison French	Administrative Support Officer	Facilities
2.19	*MDC*	Susan Hylands	Personal Assistant	Community & Leisure
2.20	*MDC*	Lynn Parker	Administrative Assistant	Community & Leisure
2.21	*MDC*	Tammy Guiver	Support & Systems Control	Benefits & Revenues
2.22	*MDC*	Nigel Harmet	River Bailiff	Facilities
2.23	*MDC*	Janet Alderman	Personal Assistant to Chief Exec	CEO Office
2.24	*MDC*	Lorna Thacker	Administrative Assistant	Waste Management
2.25	*BDC*	Jan Taylor	Technical Assistant	Council Engineers
2.26	*BDC*	Julie Tattersley	Team Leader	Housing Services
2.27	*BDC*	Sue Aldridge	Housing Assistant	Housing Services
2.28	*BDC*	Russell Gibbs	Building Services Officer	Facilities
2.29	*BDC*	Pauline Inskip	Assistant	Valuation & Estates
2.30	*BDC*	Wendy Baxter	Reception Administrator	Planning
2.31	*BDC*	Sarah Few	Graphic Designer	Graphic & Print Services
2.32	*BDC*	Anita Norgett	Customer Services Leader	Customer Services
2.33	*BDC*	Kay Dempsey	Office Manager	Environmental Services
2.34	*BDC*	Julia King	Administrator	Customer Services
2.35	*BDC*	James Egan	Waste Services Manager	Environmental Services

Appendix 6. *Phase 2* Interview Guide

Admin

- *Name, Date*
- *Introduction & Research Aims*
- *Confidentiality*
- *Recording*

……..……

Personal Information

- *Tell me a bit about yourself and what you do here*
- *What do you use Marketplace for?*
- *How long have you been using Marketplace?*
- *How many orders do you place on Marketplace each month?*

Perceived EPQ: Explain 1-7 Rating Scale (See end of interview guide)

- How do you rate how well *Marketplace* integrates with other systems in the organisation?
- How you rate the ease of reconciling invoices, with requisitions and orders using *Marketplace*?
- How do you rate the ability of *Marketplace* to be configured to your needs?
- How do you rate the reporting capability of *Marketplace*?
- How do you rate the ability of *Marketplace* to process complex orders?
- How do rate the security of *Marketplace*?
- How do you rate the availability of the system?
- How do you rate the speed at which screens load on *Marketplace*?
- How do you rate the ease of navigating through the order process using *Marketplace*?
- How do you rate the visual appeal of *Marketplace*?
- How do you rate the content of *Marketplace*, in terms of suppliers and catalogues?
- How do you rate the ease of searching for suppliers or items on the system?
- How do you rate the time it takes to place an order on *Marketplace*?
- How do you rate the authorisation process?
- How do you rate the time it takes for an order to reach a supplier using *Marketplace*?
- How do you rate the total time it takes to receive an order using *Marketplace*?
- How do you rate how often the *right* goods or services are delivered?
- How do you rate the availability of support for *Marketplace* if you have a query or problem?

- How do you rate the reliability of support personnel to get back to you when they say they will?
- How do you rate the speed of response to queries or problems?
- How do you rate the knowledge and skills of support personnel in dealing with problems?
- How do you rate the flexibility of support personnel in dealing with unusual requests?
- How do you rate how well are problems resolved?
- How do you rate the confidentiality with which your discussions are treated?
- How do you rate the attitude of support personnel when dealing with queries or problems?
- How do you rate the training you received for using *Marketplace*?
- How do you rate the information you receive regarding *Marketplace*?
- How do you rate the level of encouragement you are given to influence changes and improvement to *Marketplace*?
- How do rate the overall quality of e-procurement delivery?

System Compliance

- How many orders do you place outside of *Marketplace* each month?
- What percentage of orders do you place outside of *Marketplace*?
- What are the main reasons for this?
- How do you place orders outside of *Marketplace*?

Contract Compliance

- What percentage of orders do you place using a catalogue (contract)?
- What things influence your choice between 'free-text' and catalogue use?

Other Issues

- *Are there any of factors that influence your perceptions of e-procurement?*
- *Are there any other things you would like to talk about or expand on?*
- *Are there any issues you feel we haven't looked at?*

……

- *Thanks*
- *Further Comments Welcome*
- *Transcript Sending & Approval*

……

Phase 2 Interview 1-7 Scale

Appendix 7. *Perceived EPQ* Questionnaire

THE UNIVERSITY OF WARWICK

Marketplace User Questionnaire

WARWICK BUSINESS SCHOOL

Section A - Expectations

Section A deals with your **expectations of e-procurement**. Think about the kind of things that would make you perceive e-procurement quality as very high. Please show the extent to which you disagree or agree that such a system would possess the features described by each statement.

An E-Procurement System Should…	Strongly Disagree						Strongly Agree
…be available at all times.	1	2	3	4	5	6	7
…move quickly from one screen to the next.	1	2	3	4	5	6	7
…allow easy navigation through the order process.	1	2	3	4	5	6	7
…have many suppliers loaded.	1	2	3	4	5	6	7
…have many catalogues loaded.	1	2	3	4	5	6	7
…allow easy searching for suppliers or items.	1	2	3	4	5	6	7
…work effectively alongside the financial management system.	1	2	3	4	5	6	7
…be visually appealing.	1	2	3	4	5	6	7
…ensure orders are processed quickly.	1	2	3	4	5	6	7
…have an efficient authorisation process.	1	2	3	4	5	6	7
…ensure orders get to suppliers quickly.	1	2	3	4	5	6	7
…reduce the lead-time of orders.	1	2	3	4	5	6	7
…be capable of processing service orders.	1	2	3	4	5	6	7
…ensure that orders arrive on time.	1	2	3	4	5	6	7
…ensure that the right goods or services are delivered.	1	2	3	4	5	6	7
…ensure easy reconciliation of invoices with requisitions.	1	2	3	4	5	6	7
…be configurable by a department.	1	2	3	4	5	6	7
…allow appropriate reports to be run.	1	2	3	4	5	6	7
…be secure.	1	2	3	4	5	6	7

1

Marketplace User Questionnaire

Support provided for e-procurement should…	**Strongly Disagree**						**Strongly Agree**
…provide timely training to use the system.	1	2	3	4	5	6	7
…provide appropriate training to use the system.	1	2	3	4	5	6	7
…provide useful information about the system.	1	2	3	4	5	6	7
…encourage feedback to influence system enhancements.	1	2	3	4	5	6	7
… 'talk my language' when explaining things.	1	2	3	4	5	6	7
…always be available to deal with queries or problems.	1	2	3	4	5	6	7
…always get back to you when they say they will.	1	2	3	4	5	6	7
…respond quickly to queries or problems.	1	2	3	4	5	6	7
…be knowledgeable in dealing with queries or problems.	1	2	3	4	5	6	7
…be flexible when dealing with unusual requests or problems.	1	2	3	4	5	6	7
…deal effectively with any mistakes they make.	1	2	3	4	5	6	7
…deal confidentially with queries or problems.	1	2	3	4	5	6	7
…be friendly when dealing with queries or problems.	1	2	3	4	5	6	7
…show concern when dealing with queries or problems.	1	2	3	4	5	6	7

2

Marketplace User Questionnaire

Section B – Perceptions of *Marketplace*

Section B deals with your **perceptions of *Marketplace*** as an e-procurement system and of the support you are given for *Marketplace* within your organisation. The following set of statements relate to your feelings about *Marketplace.* Please show the extent to which you disagree or agree that *Marketplace* possesses the features described by each statement.

Marketplace…	Strongly Disagree						Strongly Agree
…is available at all times.	1	2	3	4	5	6	7
…moves quickly from one screen to the next.	1	2	3	4	5	6	7
…allows easy navigation through the order process.	1	2	3	4	5	6	7
…has the right number of suppliers loaded.	1	2	3	4	5	6	7
…has the right number of catalogues loaded.	1	2	3	4	5	6	7
…allows easy searching for suppliers or items.	1	2	3	4	5	6	7
...works effectively alongside the financial management system.	1	2	3	4	5	6	7
…is visually appealing.	1	2	3	4	5	6	7
…ensures orders are processed quickly.	1	2	3	4	5	6	7
…has an efficient authorisation process.	1	2	3	4	5	6	7
…ensures orders get to suppliers quickly.	1	2	3	4	5	6	7
…reduces the lead-time of orders.	1	2	3	4	5	6	7
…is capable of processing service orders.	1	2	3	4	5	6	7
…ensures that orders arrive on time.	1	2	3	4	5	6	7
…ensures that the right goods or services are delivered.	1	2	3	4	5	6	7
…ensures easy reconciliation of invoices with requisitions.	1	2	3	4	5	6	7
…allows configuration by a department / service unit.	1	2	3	4	5	6	7
…allows appropriate reports to be run.	1	2	3	4	5	6	7
…is secure.	1	2	3	4	5	6	7

Marketplace User Questionnaire

The support for *Marketplace*...	**Strongly Disagree**						**Strongly Agree**
...provided me with timely training to use the system.	1	2	3	4	5	6	7
...provided me with appropriate training to use the system.	1	2	3	4	5	6	7
...provides useful information about the system.	1	2	3	4	5	6	7
...encourages feedback to influence system enhancements	1	2	3	4	5	6	7
... 'talks my language' when explaining things to me.	1	2	3	4	5	6	7
...is always available to deal with my queries or problems.	1	2	3	4	5	6	7
...always gets back to me when they say they will.	1	2	3	4	5	6	7
...responds quickly to my queries or problems.	1	2	3	4	5	6	7
...is knowledgeable in dealing with my queries or problems.	1	2	3	4	5	6	7
...is flexible when dealing with unusual requests or problems.	1	2	3	4	5	6	7
...deals effectively with any mistakes they make.	1	2	3	4	5	6	7
...deals confidentially with my queries or problems.	1	2	3	4	5	6	7
...is friendly when dealing with queries or problems.	1	2	3	4	5	6	7
...shows concern when dealing with my queries or problems.	1	2	3	4	5	6	7

Overall E-Procurement Rating	**Very Poor**						**Excellent**
How do you rate the overall quality of e-procurement delivery in your organisation?	1	2	3	4	5	6	7

Section C – Individual Information

Name:	Job Role:
Organisation:	Number of employees in department:
Department:	Number of *Marketplace* users in department:

4

THE UNIVERSITY OF WARWICK

Marketplace User Questionnaire

WARWICK BUSINESS SCHOOL

7

1. How long have you been using *Marketplace*? .....Years & .....Months

2. What do you use *Marketplace* for? (Tick all applicable)

□ Ordering □ Authorisation □ Receipting □ Payment □ Reporting

**** If you don't use Marketplace for ordering please go to question***

3. What percentage of orders do you place using *Marketplace* as opposed to other methods? .....%

4. Approximately, how many orders do you place each month using *Marketplace*?

□ < 5 □ 6 - 10 □ 11 - 15 □ 16 - 20 □ 21 - 25 □ 26 - 50 □ 51 - 100 □ 101 +

5. Approximately, how many orders do you place each month outside of *Marketplace*? (i.e. paper orders)

□ < 5 □ 6 - 10 □ 11 - 15 □ 16 - 20 □ 21 - 25 □ 26 - 50 □ 51 - 100 □ 101 +

6. What percentage of orders are placed 'free-text' compared with via e-catalogue? .....%

	Very Poor						**Excellent**
7. How do you rate your IT skills?	1	2	3	4	5	6	7

Please use this space for any additional comments. For example, are there any changes to the e-procurement delivery that you would like to see?

Thank you for taking the time to complete this questionnaire.

5

Appendix 8. Cover Letter

***Marketplace* User Questionnaire**

22nd November, 2004

Dear Anna,

Thank you so much for agreeing to complete the *Marketplace* user questionnaire. The aim is to understand your expectations of e-procurement and contrast these with your perceptions of *Marketplace*. Whether you use the system a little or a lot, I'm interested in your views. Remember, there are no wrong answers!

The questionnaire will take no more than 10 minutes to complete. Once completed, please return it to me in the pre-paid envelope provided.

Please be assured that your responses are completely confidential and will only be seen by myself.

I really appreciate your participation in this piece of research. Thank you for taking the time to complete the questionnaire.

Yours sincerely,

AM

Alistair Brandon – Jones
Doctoral Researcher
Operations Management Group

If you have any queries, please contact me.

Tel: 01865 820 883 E-mail: alistair.brandon-jones@wbs.ac.uk

Appendix 9. *Phase 3* Respondents (November 2004)

Organisation	Sample	Respondents	Response
Essex CC	156	142	91.0%
Braintree DC	44	41	93.2%
Maldon DC	41	39	95.1%
Tendring DC	54	52	96.3%
Total	**295**	**274**	**92.9%**
Gender	**Female**		68%
	Male		32%
Job Type	**Managerial**		21%
	Clerical		79%
Experience	**Range**		1-24 Months
	Mean		7.43 Months
E-Procurement Use	**Ordering**		92.3%
	Authorisation		51.3%
	Receipting		62.7%
	Reporting		47.4%
	Payment		26.1%
Orders Placed Per Month	**<5**		39.1%
	6-10		21.2%
	11-15		8.4%
	16-20		7.7%
	21-25		4.7%
	26-50		6.2%
	51-100		1.1%
	>101		.7%
	N/A or Left Blank		10.9%

Appendix 10. *Phase 2* Descriptive Data

Interviewee	FMS Integration	Invoice Reconciliation	System Configurability	Reporting Capability	Process Complex Orders	System Security	System Availability	Screen Loading	System Navigation	Visual Appeal	Content*	Ease of Search	Order Processing	Ease of Authorisation	Orders to Suppliers	Order Lead-Time
2.1	6	9	7	8	7	4	7	8	8	8	6	6	8	8	9	8
2.2	5	8	5	5	4	5	4	3	5	3	2	2	6	3	8	8
2.3	5	8	5	5	3	5	4	3	5	3	2	1	5	4	8	8
2.4	5	8	5	5	4	5	3	7	6	6	5	1	2	8	8	7
2.5	5	8	5	5	5	5	3	7	6	6	5	1	3	8	9	7
2.6	5	8	4	5	5	5	9	5	5	8	6	5	5	8	8	8
2.7	5	5	4	5	3	2	5	4	4	5	5	5	5	5	5	5
2.8	2	5	5	5	6	5	8	5	6	5	5	3	6	5	6	5
2.9	5	8	6	5	6	8	9	7	9	8	6	4	8	6	9	9
2.10	5	5	4	4	4	5	5	5	5	5	5	3	5	5	5	5
2.11	5	7	5	5	5	8	7	7	7	6	8	7	6	8	8	8
2.12	4	5	5	4	4	4	4	4	9	4	8	4	4	5	7	4
2.13	4	4	5	5	5	5	3	5	3	4	6	5	5	3	7	7
2.14	5	7	7	5	8	8	8	6	8	8	8	8	7	8	8	8
2.15	7	6	5	5	8	5	5	5	5	5	5	4	5	5	5	5
2.16	2	5	7	4	4	4	8	6	8	5	2	4	5	5	5	5
2.17	4	5	6	5	5	5	7	9	9	9	5	3	9	9	5	6
2.18	3	5	5	6	5	6	5	5	5	5	4	3	5	5	5	5
2.19	4	3	2	3	3	5	8	4	3	6	4	3	7	5	8	5
2.20	4	5	1	5	2	5	8	5	2	5	4	3	7	5	7	5
2.21	3	5	5	6	5	6	5	5	5	5	4	3	5	5	5	5
2.22	6	6	6	6	8	6	5	5	7	5	5	5	6	6	5	6
2.23	4	5	6	5	5	5	7	8	8	9	5	5	9	8	5	8
2.24	3	4	6	5	4	4	7	7	8	6	3	4	4	4	5	5
2.25	5	7	5	5	6	8	8	8	7	5	8	8	6	9	7	7
2.26	3	5	7	5	5	4	9	6	8	6	3	4	6	5	5	5
2.27	3	5	5	6	5	6	5	6	5	5	5	4	5	5	6	6
2.28	6	6	6	6	8	6	5	5	7	5	5	5	6	6	5	6
2.29	4	5	3	5	3	5	8	5	3	5	4	3	7	5	8	5
2.30	3	5	6	5	5	5	7	9	9	9	5	4	9	9	5	6
2.31	5	6	6	5	9	9	8	6	8	8	8	8	7	8	8	8
2.32	4	3	2	3	3	5	8	4	3	6	4	3	7	5	8	5
2.33	7	6	5	5	8	5	5	5	5	5	5	4	5	5	5	5
2.34	3	5	6	5	4	5	7	7	8	6	2	4	4	5	5	5
2.35	6	7	5	5	6	6	7	9	7	5	8	8	6	9	7	7

Continued…

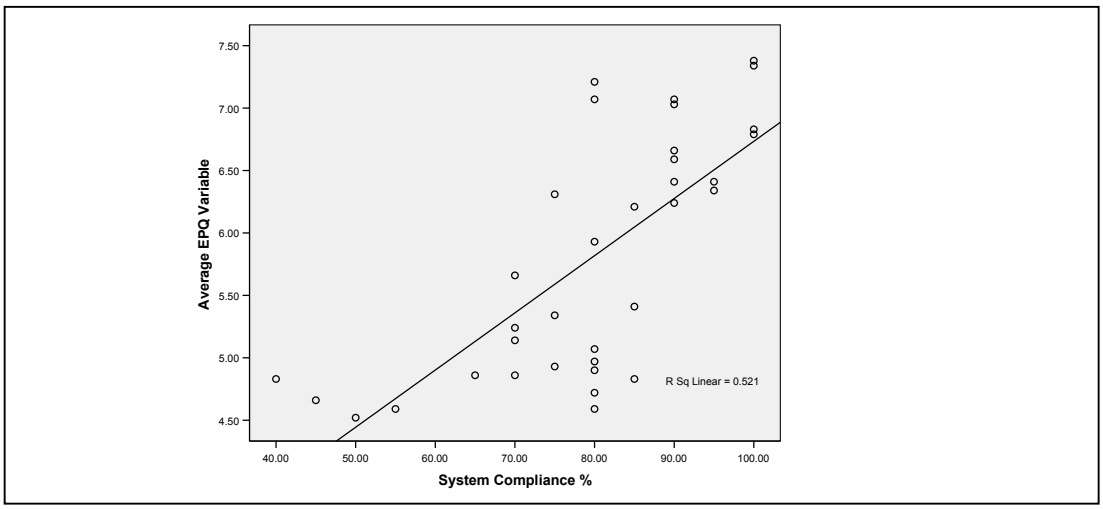
Interviewee	On-Time Delivery	Order Accuracy	Support Availability	Support Reliability	Support Responsiveness	*Knowledge & Skills	Support Flexibility	Problem Resolution	Confidentiality	*Attitudes	*Training	Information Provision	Encouraging Feedback	Average Variable	*OEPQ Rating* (1-9)	System Compliance %	Contract Compliance %
2.1	8	7	7	8	7	8	7	8	8	8	7	7	6	7.34	8	100	40
2.2	8	8	9	9	9	8	7	9	9	9	8	9	8	6.41	6	90	20
2.3	8	7	9	9	9	8	7	9	9	9	8	9	8	6.31	5	75	45
2.4	6	8	8	9	9	8	9	8	5	9	6	8	8	6.41	7	95	30
2.5	6	8	8	9	9	9	9	8	5	9	7	8	8	6.59	6	90	20
2.6	8	9	5	5	5	6	6	5	5	8	7	8	5	6.24	6	90	40
2.7	6	5	4	5	5	5	4	5	5	5	5	4	3	4.59	5	80	30
2.8	6	5	5	5	6	6	5	6	5	6	4	5	1	5.07	6	80	80
2.9	9	9	9	9	8	9	7	9	9	9	3	6	5	7.38	8	100	50
2.10	5	5	5	5	5	5	5	5	5	6	5	4	5	4.83	5	85	50
2.11	7	9	5	5	4	7	7	6	7	6	4	5	5	6.34	7	95	30
2.12	5	5	7	7	7	7	6	6	5	8	5	5	5	5.41	7	85	45
2.13	7	7	9	9	9	8	9	9	9	9	8	6	5	6.21	7	85	40
2.14	5	5	8	8	8	8	7	7	7	8	7	5	5	7.07	7	80	20
2.15	5	5	5	5	5	5	5	6	5	5	9	5	5	5.34	5	75	20
2.16	5	4	5	5	5	5	5	5	5	5	4	4	5	4.86	5	70	10
2.17	6	7	9	9	9	9	9	8	9	9	7	7	6	7.07	7	90	50
2.18	5	5	5	5	5	5	4	5	5	5	2	4	5	4.72	5	80	30
2.19	4	4	6	6	5	5	5	5	5	5	3	3	2	4.52	4	50	15
2.20	6	6	5	5	5	6	4	4	5	5	4	3	2	4.59	4	55	15
2.21	5	5	6	6	6	5	4	5	5	5	3	4	5	4.86	5	65	20
2.22	5	6	6	6	6	7	7	6	6	7	7	5	5	5.93	5	80	25
2.23	6	7	7	7	6	7	8	8	8	8	6	7	6	6.66	7	90	50
2.24	5	5	5	5	5	5	5	5	5	5	4	4	5	4.90	5	80	35
2.25	6	7	8	8	8	8	6	8	5	9	4	5	7	6.83	7	100	90
2.26	5	5	5	5	5	5	5	5	5	5	4	4	5	5.14	5	70	25
2.27	5	5	5	5	5	5	4	5	5	5	3	4	5	4.93	5	75	20
2.28	5	6	5	5	5	6	6	5	6	7	5	5	5	5.66	5	70	20
2.29	7	7	5	5	5	6	4	4	5	5	4	3	2	4.83	4	40	10
2.30	6	7	9	9	9	9	9	8	9	9	6	7	6	7.03	7	90	50
2.31	5	5	9	9	9	9	7	7	7	8	7	5	5	7.21	7	80	20
2.32	4	4	6	6	5	6	6	5	6	5	4	3	2	4.66	4	45	15
2.33	5	5	5	5	5	5	5	6	5	5	6	5	5	5.24	5	70	10
2.34	5	5	5	5	5	5	5	5	5	5	4	4	5	4.97	5	80	30
2.35	6	7	8	8	8	8	6	8	5	9	4	5	7	6.79	8	100	90

Appendix 11 Relationship between *Perceived EPQ* & *System Compliance*

Phase 2 Data Analysis

The scatter plot below suggests that as internal customer perceptions of e-procurement quality go up, there is an increasing likelihood of compliance with an e-procurement system.

Scatter plot: Average *EPQ* Variable to System Compliance



The strength of this relationship is indicated by the correlation value of .722 (**) shown in the correlation table below.

Pearson Correlation: System Compliance & Average *EPQ*

		System Compliance %
Average *EPQ*	Pearson Correlation	.722(**)
	Sig. (2-tailed)	.000
	N	35

** Correlation is significant at the 0.01 level (2-tailed).

Linear regression analysis was carried out to explore the extent to which *Perceived EPQ* may predict system use. Results indicate that over half (Adjusted R^2 = .507) of all system compliance can be explained by average *EPQ* variable scores.

Linear Regression: Average *EPQ* to System Compliance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722(a)	.521	.507	10.61800

Predictors: (Constant), Average *EPQ*

In addition, stepwise regression was carried out to produce a smaller set of explanatory variables for system compliance. The best solution with four variables (*attitudes, support availability, problem resolution,* and *system navigation*) explains 76.8% of variance in system compliance. This indicates the value of using a combination of variables or factors to explain variance in system compliance, rather than relying on an average *EPQ* score or the *OEPQ Rating.*

Stepwise Regression: All *EPQ* Variables to System Compliance

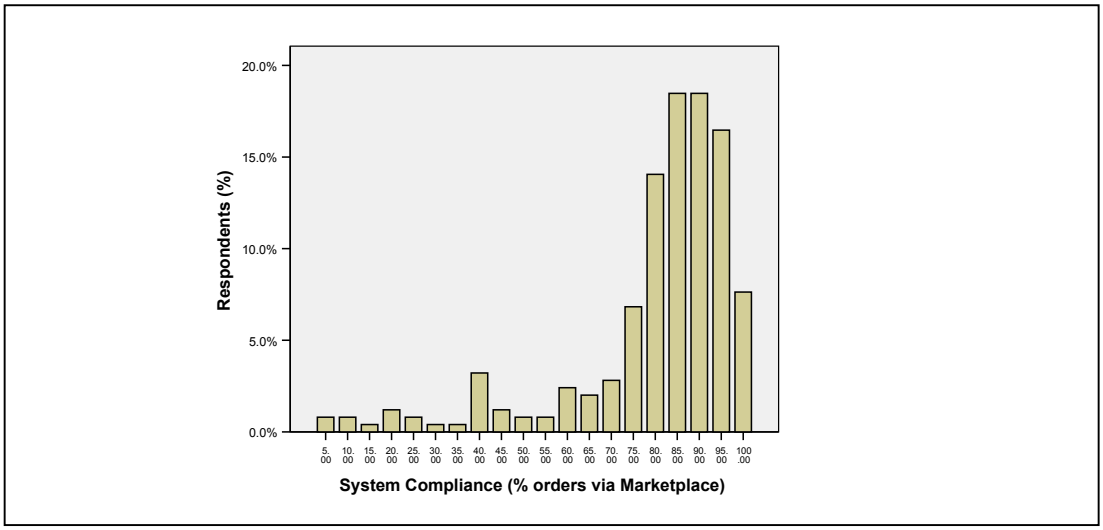
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.692(a)	.479	.463	11.07617
2	.780(b)	.608	.584	9.75476
3	.829(c)	.687	.657	8.85233
4	.867(d)	.752	.719	8.01699
5	.893(e)	.797	.762	7.37688
6	.892(f)	.795	.768	7.27918

a Predictors: (Constant), Attitudes
b Predictors: (Constant), Attitudes, System Configurability
c Predictors: (Constant), Attitudes, System Configurability, Support Availability
d Predictors: (Constant), Attitudes, System Configurability, Support Availability, Problem Resolution
e Predictors: (Constant), Attitudes, System Configurability, Support Availability, Problem Resolution, Navigation
f Predictors: (Constant), Attitudes, Support Availability, Problem Resolution, System Navigation

Phase 3 Data Analysis

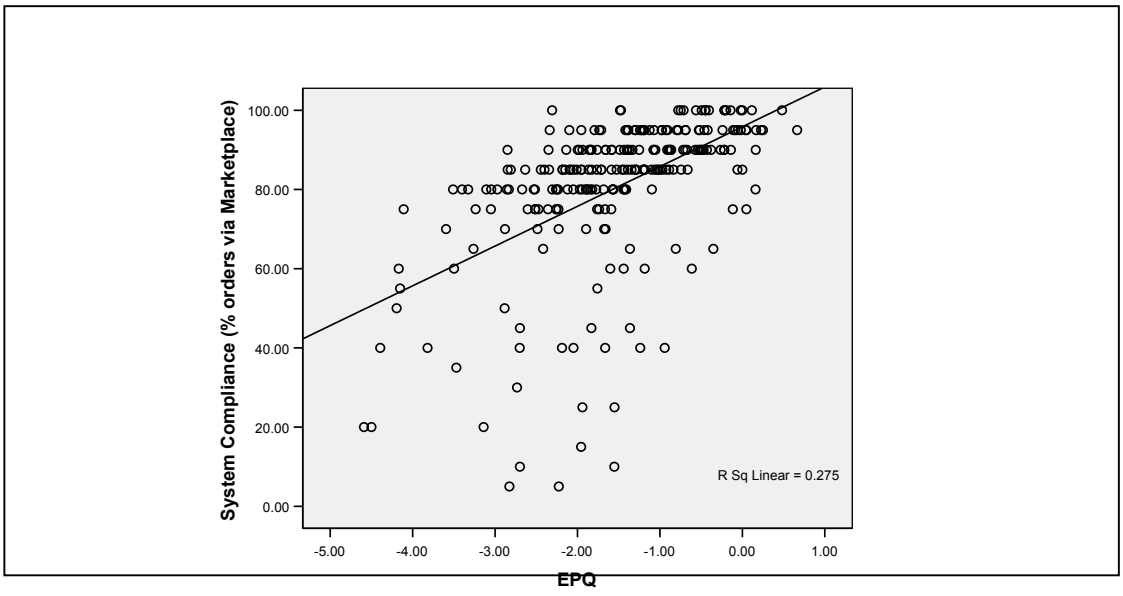
The figure below indicates the level of system compliance based on questionnaire data. Of the 249 individuals providing information on their use of *Marketplace*, just over 80% of all orders go through the e-procurement system.

System Compliance for *Marketplace*



The positive relationship between system compliance and *Perceived EPQ* is indicated by the scatter plot in the figure below.

Scatter plot: *EPQ Score* to System Compliance



The Pearson correlation coefficient shows the linear association between the two variables. The absolute value (.525) indicates the strength of this relationship, whilst the very small significance level provides further evidence that the two variables are linearly related.

Pearson Correlation: *EPQ Scale* and System Compliance

		System Compliance %
EPQ	Pearson Correlation	.525(**)
	Sig. (2-tailed)	.000
	N	249

** Correlation is significant at the 0.01 level (2-tailed).

To examine the extent to which system compliance is predicted by *Perceived EPQ*, regression analysis was undertaken. 27.2% of variance in system compliance is explained by the *EPQ Score*.

Linear Regression: *EPQ Scale* to System Compliance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.525(a)	.275	.272	16.55166

Predictors: (Constant), EPQ

Step-wise regression was also carried out to assess whether a combination of *EPQ* factors could more accurately predict system use. The best solution contains three factors (*Professionalism, Content,* and *Specification*) which explain 30.4% (Adjusted R^2) of variance in system compliance. The small difference between the two models is unsurprising given the fact that *Perceived EPQ* score is the average of the six *EPQ* factors.

Stepwise Regression: *EPQ Factors* to *System Compliance*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.511(a)	.262	.259	16.70946
2	.548(b)	.300	.294	16.30319
3	.559(c)	.313	.304	16.18415

a Predictors: (Constant), Professionalism
b Predictors: (Constant), Professionalism, Content
c Predictors: (Constant), Professionalism, Content, Specification

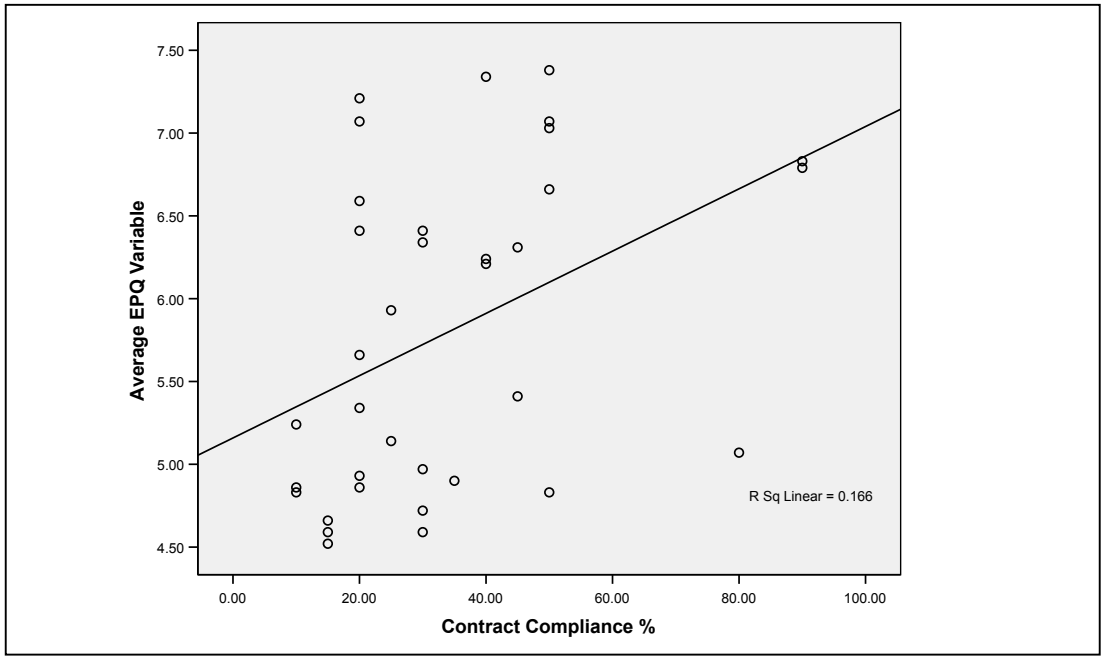
Finally, regressions were carried out separately for each of the *EPQ* factors to examine their ability to independently predict *System Compliance.* As already shown in the stepwise regression, *Professionalism* is the most powerful predictor of *System Compliance* (R^2 .259). This is followed by *Specification* (R^2 .148), *Processing* (R^2 .148), *Content* (R^2 .135), and *Specification* (R^2 .129). The least powerful predictor in this case was *Training* (R^2 .100).

Appendix 12 Relationship between *Perceived EPQ* & *Contract Compliance*

Phase 2 Data Analysis

The scatter plot below suggests that as internal customer perceptions of e-procurement quality go up, there is an increasing likelihood of contract compliance.

Scatter plot: Average *EPQ* Variable to *Contract Compliance*



The strength of this relationship is indicated by the correlation table below. Whilst *Phase 2* suggests a connection between *EPQ* scores and contract compliance, the strength (.407) and significance (0.05) of this relationship may be lower than for System Compliance.

Pearson Correlation: *Contract Compliance* & Average *EPQ*

		Contract Compliance %
Average *EPQ*	Pearson Correlation	.407(*)
	Sig. (2-tailed)	.015
	N	35

* Correlation is significant at the 0.05 level (2-tailed).

Linear regression was used to explore the likely predictive power of *Perceived EPQ* on *contract compliance*. 14% of variance in *contract compliance* is directly explained by the average *EPQ* score.

Linear Regression: Average *EPQ* to *Contract Compliance*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.407(a)	.166	.140	19.24018

a Predictors: (Constant), Average *EPQ*

As with *system compliance,* it was considered likely that a regression model with a combination of *EPQ* variables may be more powerful in predicting *contract compliance* than a single average score. Stepwise regression suggested a combination of four variables (*attitudes, training, orders to suppliers,* and *support flexibility*) that in combination predicted nearly half (R^2 = .499) of all variation in *contract compliance.* This is a significant improvement on the prediction of the average *EPQ* score.

Stepwise Regression: All *EPQ* Variables to *Contract Compliance*

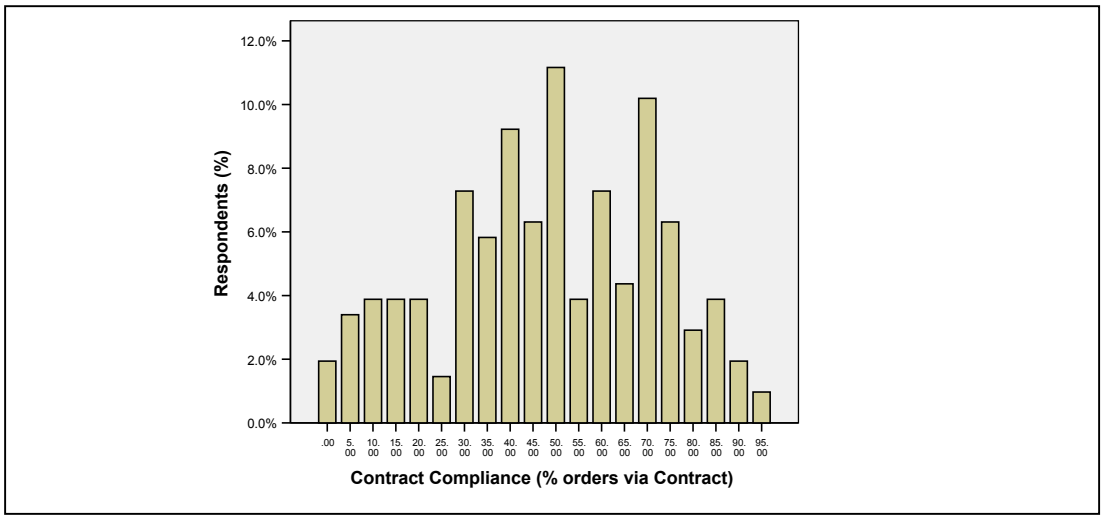
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.506(a)	.256	.233	18.16947
2	.633(b)	.401	.364	16.55017
3	.701(c)	.491	.441	15.50780
4	.747(d)	.558	.499	14.69302

a Predictors: (Constant), *Attitudes
b Predictors: (Constant), *Attitudes, *Training
c Predictors: (Constant), *Attitudes, *Training, Orders to Suppliers
d Predictors: (Constant), *Attitudes, *Training, Orders to Suppliers, Support Flexibility

Phase 3 Data Analysis

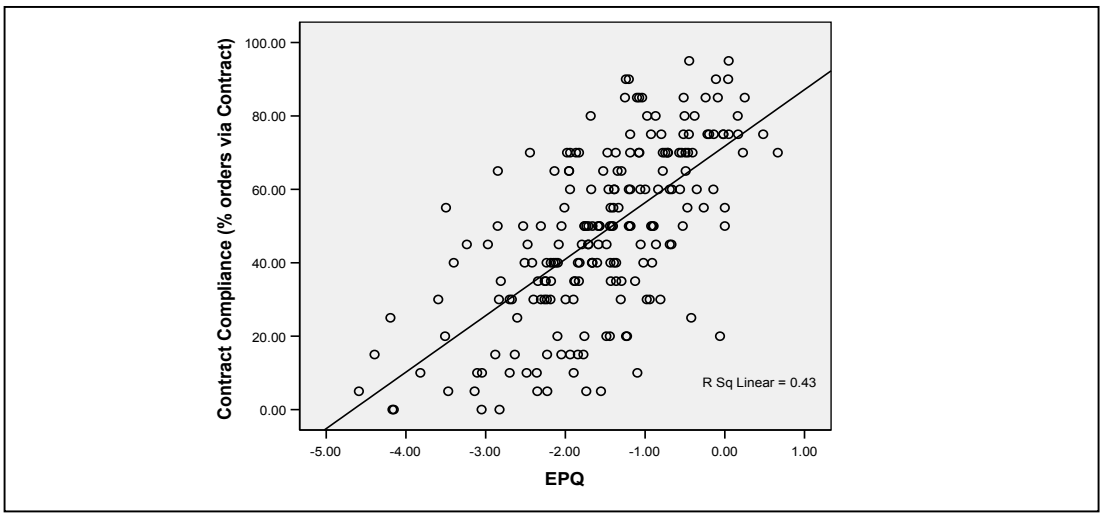
The figure below provides details of contract compliance based on survey data. Of the 206 individuals providing information on their use of Contracts, 48.1% of all orders are placed through a central contract.

Contract Compliance for *Marketplace*



The scatter plot below shows the positive relationship between contract compliance and *Perceived EPQ.*

Scatter plot: *Perceived EPQ* to *Contract Compliance*



The Pearson correlation coefficient demonstrates this linear association is both strong (.656) and significant.

Pearson Correlation: *EPQ Scale* & Contract Compliance

		Contract Compliance %
EPQ	Pearson Correlation	.656(**)
	Sig. (2-tailed)	.000
	N	206

** Correlation is significant at the 0.01 level (2-tailed).

Regression analysis indicates that just under half (R^2 = .427) the variance in contract compliance is explained by the *EPQ Score*.

Linear Regression: *EPQ Scale* to Contract Compliance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.656(a)	.430	.427	17.68950

Predictors: (Constant), *EPQ Score*

In addition, a combination of four *EPQ* factors *(Processing, Content, Professionalism* and *Specification*) explains 44.8% of variance in Contract Compliance.

Stepwise Regression: *EPQ* Factors to Contract Compliance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.567(a)	.321	.318	19.30318
2	.652(b)	.425	.419	17.80531
3	.670(c)	.448	.440	17.48603
4	.678(d)	.459	.448	17.35661

a Predictors: (Constant), Processing
b Predictors: (Constant), Processing, Content
c Predictors: (Constant), Processing, Content, Professionalism
d Predictors: (Constant), Processing, Content, Professionalism, Specification
e Dependent Variable: Contract Compliance (% orders via Contract)

Finally, regressions were carried out separately for each of the *EPQ* factors to examine their ability to independently predict *Contract Compliance.* As already shown in the stepwise regression, *Processing* is the most powerful predictor of *Contract Compliance* (R^2 .318). This is followed by *Content* (R^2 .305), *Specification* (R^2 .250), *Professionalism* (R^2 .210), and *Usability* (R^2 .196). In line with *System Compliance*, *Training* is also the least powerful predictor of *Contract Compliance* (R^2 .140).